INFANTRY JOURNAL

Vol. XIII SEPTEMBER-OCTOBER, 1916 No. 2

Study on the Attack in the Present[1] Period of the War.[2]

Impressions and Reflections of a Company Commander.

By Captain Andre Laffargue, 153d Infantry (French).

I.

Character of the Present Attack.

THE ATTACK at the present period has become one of siege warfare. We must accept it as it is, study it, tax our wits to find special means to prepare effectively for it and to orient the instruction of troops entirely with this in view.

The attack on all points of our front consists in breaking through several lines of defense upon a depth of about three kilometres and in preventing the enemy from holding on further back on new lines already prepared or merely improvized.

The attack is therefore an immense, unlimited, simultaneous assault on all points of the front of attack, furiously pushed straight to the front until all the enemy's defenses are broken through.

The characteristic of this attack is that it is not progressive but is an assault of a single rush; it must be accomplished in one day as otherwise the enemy reforms, and the defense, with terrible engines of sudden destruction, will later recover its supremacy over the attack, which cannot quickly enough regain the mastery of this consuming fire.

[1] August, 1915.

[2] Étude sur l'attaque dans la période actuelle de la guerre—Impressions et réflexions d'un commandant de compagnie; Paris, Librairie Blon, 1916. Communicated to the French Army by the Commander-in-Chief. Translated for the INFANTRY JOURNAL by an officer of infantry.

The whole series of frightful defenses cannot be nibbled at successively; they must be swallowed whole at one stroke with one decision.

Therefore, the fight is an unlimited assault. In order to attempt the assault, what is necessary?

Assaulting troops—and all troops are far from being assaulting troops.

An overwhelming superiority of fire all the time and not only at the moment of assault.

The possibility of rushing forth from a line of shelter a short distance from the enemy, a condition equally to be sought for in any other phase of the combat.

In order that the assault may be unlimited, the sacrifice being resolved upon, it must be pushed through to a finish and the enemy drowned under successive waves, *calculating, however, that infantry units disappear in the furnace of fire like handfuls of straw.*

Is it possible to pierce the enemy's lines? I firmly believe so since the 9th of May.[3] But before that, this hypothesis seemed to me a mad temerity. I had taken part in the Battle of Nancy and in the Battle of Ypres where it appears that the Germans, after a terrifying deluge of heavy projectiles during interminable days, tried to break through us, which I certainly did not think possible seeing the paltry and easily shattered efforts of their infantry. In considering the forces put into action which did not succeed in making us yield a foot, I believed in the inviolability of the lines of defense. On the 9th of May, by a single dash, our first wave submerged in one hour all the enemy's first-line defenses to a depth of several kilometres.

The assault is extremely murderous; it is an implacable struggle in which one or the other must fall and in which the engines of combat not destroyed beforehand often make terrible havoc in the ranks of unprotected assaulting troops.

He who risks his life and does not wish to die but to succeed, becomes at times ingenious. That is why I, who was part of the human canister for more than nine months, have set about to consider the means of saving the inestimable existence of so many humble comrades, or at least to figure out how the sacrifice of their lives may result in victory.

[3] The great French offensive on Neuville-Saint-Vaast north of Arras.—TRANSLATOR.

II.

Preparation of the Attack.

Forms of the German defensive organizations.

The German defensive organizations, as well as I have been able to establish, appear to be in general as follows:[4]

1. A continuous line of trenches over the whole front, comprising on a limited depth two or three trenches, joined by numerous communicating trenches (*boyaux*), and separated by 100 to 300 metres, each one often protected by a wire entanglement.

2. Centers of resistance, comprising large villages, woods, or immense field works, consisting of a network of trenches which are very strongly organized and in which machine guns under cupolas as well as pieces of artillery are mounted.

Such are, for example, the Labyrinth and *Ouvrages Blancs* of Neuville. These centers of resistance are separated by intervals of 800 to 1,500 metres; they mutually flank each other, and their intervals are generally guarded by closed works.

3. A second line of defense, which is not always continuous.

Preparation by the artillery.

In order to attack with minimum loss, the infantry requires that the artillery in its preparation carry through the following program:

(*a*) *Destroy the wire entanglements.*
(*b*) *Neutralize or destroy the defenders of the trenches.*
(*c*) *Prevent the artillery from coming into action.*
(*d*) *Prevent the bringing up of reserves.*
(*e*) *Destroy the machine guns as soon as they reveal their positions.*

(*a*) *Destruction of the Wire Entanglement.*

The 75 produces sufficient breaches in the wire entanglements for infantry to get through; in order to accomplish this, each piece remains laid on the same point of the entanglement. But the infantry should not expect the complete and continuous destruction of the entanglement: that would require too many projectiles.

(*b*) *Neutralization or Destruction of the Defenders of the Trenches.*

The Germans, whenever they can, dig very deep and well pro-

[4] See Plate II at end of this article.

tected shelters, in the interior of which they crowd themselves. The 75 has no effect on these shelters, and the infantry of the attack, who are delighted to see the parapets, the sand bags, planks, posts, etc., fly into the air as if pulverized by the ripping detonations, are stupefied on finding themselves greeted by a heavy fire as soon as they start out of their trenches. In consequence of this, the infantry is convinced that whenever the enemy has been able to construct deep shelters, an assault is certain massacre, in spite of the prodigious expenditure of 75's, unless other and more powerful means of destruction have been employed.

The aerial torpedo, on the contrary, seems to produce terrifying effects on the defenders of the trenches; it has also considerable destructive effect. This power is not always sufficient to break in the shelter caverns, but it completely knocks to pieces the firing trenches, produces cave-ins, blocks the openings of the shelters, and thus walls in the occupants. By its formidable explosion, the extraordinary effects of its blast, and the concussion that it induces in the ground, it annihilates all energy in the defenders, who at every instant think their last minute has come.

In the sector of attack of my company on the 9th of May, a portion of the trenches in front of the 3d and 4th Sections was severely pounded by the fire of the 75 and especially by the aerial torpedoes, while the remainder of the trenches in front of the 1st and 2d Sections suffered only from the preparation by the 75. The difference was remarkable. While the 1st and 2d Sections, hardly out of their parallel, saw the enemy rise up and melted away under his suddenly opened rifle fire, and especially under that of a machine gun, the 4th Section reached the German trench, crossed it without hindrance, and continued on its way. As for the 3d Section, it had been received by only a few shots and had crossed the first trench in one rush, when it received some shots in the back. Returning to the rear, the men found several dozen Germans crouching in the deep shelters, absolutely all in and crying for mercy. The cannonade had ceased, and in spite of the violent fusillade cracking outside announcing an attack, they had not budged. Only a few had the courage to shoot in the back from an opening the French soldiers who passed close by.

Conversations with numerous infantry officers have definitely convinced me that the heaviest bombardment by 75's alone is ineffective against trenches organized during a long period. The

heavy artillery has too much dispersion, while the aerial torpedo, besides its considerable destructive and demoralizing effects, is very accurate.

Thus the preparation on the zone of the first trenches may be made largely by means of aerial torpedoes. But it is necessary that the torpedo guns be placed close together in a continuous line (at least one to every 100 meters of trenches) and that each one have its zone clearly defined.

At Arras, these guns were not very numerous, and their preparation was consequently only partial; in trying to pound several lines of trenches at the same time, large spaces remained outside the effects of their action, while certain corners were entirely demolished.

In the artillery depots, very numerous gun crews should be organized beforehand for the torpedo guns, and not date only from the day before and be at their first try out, as at Arras.

The aerial torpedo, terrorizing the defenders in the interior of their shelters, already neutralizes them in part; but the best plan of eliminating the enemy is to destroy him. In order to destroy him, it is necessary to force him to expose himself, to oblige him to come out to become the prey of the iron hail. For this there are several means:

Have the infantry advance during the preparation by the artillery;

Simulate the attack,

Finally a third method that can be transferred from the domain of fox hunting to that of the war with Germany: smoke him out.

The first plan is not applicable from first trenches as they are too near the enemy; we shall speak of this again.

In order to simulate an attack, interrupt the artillery fire suddenly and *open rifle fire with a great deal of shouting;* the enemy hurries out immediately to his combat positions; after several minutes' waiting, a violent rafale of 75. This is what we did from time to time when we wished to make the Germans come out into their trenches so that we could demolish some of them by artillery fire. At Arras, there was a brusque interruption of artillery fire for ten minutes, but it was an absolute and impressive silence. The Germans were not misled by it, and when the interruption for the real attack came with its fusillade and noise, they manned their trenches to meet it.

As a third scheme *we have suffocating grenades and cartridges*, which irritate the eyes and produce tears and render the neighborhood of the spot where they fall untenable for several minutes. We could also have projectiles of larger dimensions, containing materials giving off heavy, suffocating gas. Thus this gas would creep over the ground, fall into the bottom of the trenches, and enter the shelters, driving out the occupants, who would then come under the fire of the high-explosive shells. This gas, being, moreover, only suffocating, would afterwards have the advantage of not incommoding our soldiers in their trench or during the attack.

While the heavy artillery may be replaced very advantageously by torpedoes for the preparation on the continuous line of trenches, it may be employed effectively against the centers of resistance, where its more concentrated effects will not produce the simply superficial disorganization of the 75, which leaves the cupolas of the machine gun intact.

The most important part to destroy in the centers of resistance *are the edges*, for the attack breaks through easily enough in the intermediate spaces but immediately comes under flanking fire. Moreover, a center of resistance whose borders are disorganized, becomes a harmless island, the attack of which by main strength would be terribly costly; for instance, the Labyrinth, Neuville-Saint-Vaast, Carency, which were passed by in less than an hour by groups arriving at the Cemetery of Neuville, at the La Folie Woods, and at the first houses of Souchez. *Therefore try especially to neutralize the borders* by concentrating on them the fire of batteries suitably placed with a view to following the attack on the intervals. If one could put a *veil over the centers of resistance* to isolate them and obstruct the view of the flanking works, the problem would be partly solved. It would then be necessary to have projectiles giving off large quantities of heavy smoke, which would spread out over the ground and dissipate very slowly.

The intermediate works in the intervals are easy to take because of their small dimensions. On the 9th of May, they were generally found knocked to pieces.

(*c*) *Preparation against Artillery.*

The infantry urgently demands that the hostile artillery be put out of action before the attack. If the enemy artillery gets into

action, the troops, crowded into the trenches, *boyaux*,[5] and parallels, have to suffer a painful bombardment, which causes losses and obliges everyone to hunt cover—an inauspicious attitude for troops which will have shortly to rush forward. Communications become difficult, the telephonic connections are broken, everyone gets nervous and perturbed. On the attack proper, artillery fire has an extraordinary disturbing effect; the bullets and machine guns cause disorder by the sudden and serious losses they occasion, but the shells spread confusion almost solely by the sight and the crash of explosions. On the 9th of May, we hardly received any shells at all, not one during the attack itself, and this contributed in a large degree to the magnificent *élan* of the first attacking waves.

At Langemarck on the contrary, in a night attack on the trenches on the 4th of December, the unsilenced hostile artillery bombarded our trenches of departure, and I had my second section dispersed through being saluted by a rafale of shrapnel that had put the chief of section and the file-closers, *hors de combat*.

In order to silence the hostile artillery, it seems that, knowing the probable emplacement of the batteries, it would be necessary suddenly and without warning to let loose on them a deluge of fire. The personnel of these batteries not being continually at their firing positions, this sudden tempest would surprise them and keep them inside their shelters. In the midst of the confusion, the fire of the batteries which try to get into action is much disturbed, impeded, and frequently interrupted. On the 9th of May, the hostile artillery must have been completely surprised and literally stupefied during the whole morning, for they abandoned their infantry. Only a few pieces fired some hasty shots.

In order to render the emplacements of the batteries completely untenable, they might be overwhelmed with shells giving off clouds of smoke and also asphyxiating shells; by this means the cannoneers would be obliged to quit their pieces or serve them under extremely difficult conditions.

The aviators hovering over the hostile lines could complete the preparation by indicating by means of luminous balls to the batteries on watch the hostile batteries not yet silenced or which have come into action.

[5]Communicating trenches.

(d) Preparation against Reinforcements and Reserves.

In the second and third trenches, the garrison does not generally occupy its firing positions; it is obliged to get to them in case of attack. As long as the artillery preparation lasts, it does not budge from the shelters; but as soon as the artillery ceases its fire, the garrison hastily mans the positions. It is necessary then for the artillery to extend its fire to the second and third lines and to continue this fire while the infantry rushes the first line. The approach trenches and their junctions should especially be swept. This has, moreover, the advantage of keeping crouched in their holes the defenders of the first line, who are not reassured by sensing the compact sheaves of the terrible explosive passing close over their heads. The preparation on the second line of defense is absolutely identical.

It is next necessary to cut the battlefield in two and isolate the zone of the first and second lines of defence, constantly manned by the troops near their combat positions, from the zone of cantonment. It is a matter of establishing an insuperable barrier. A barrier solely of ordinary shell fire is extremely expensive. The Germans have more simply solved the question by establishing a barrier of asphyxiating gas. They have employed this extremely effective scheme, it seems, at Bagatelle in the Argonne, on the 30th of June and the 1st and 2d of July.

The bombardment of the cantonment by long-range heavy guns throws disorder among the troops who are at rest. Suddenly surprised in the most profound quietude, the alarm causes all the more flurry and demoralization. Obliged to follow roads sprinkled here and there with fragments, they thus arrive diminished in number on the field of battle.

(e) Destruction of Machine Guns.

The weapon which inflicts the heaviest losses on infantry is the machine gun, which uncovers itself suddenly and in a few seconds lays out the assailants by ranks. It is therefore absolutely necessary to destroy them before the attack or have the means of putting them out of action as soon as they disclose themselves.

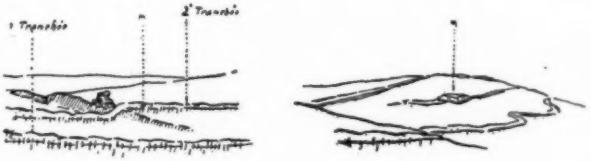
During the days which precede the attack, a minute study of the hostile trenches should be made by the infantry officers who have to attack them, in concert with the artillery officers who pound the same trenches; their study should bear especially upon the emplacements of the hostile machine guns.

The machine-gun emplacements are recognized in the continuous trenches by the low horizontal loopholes much larger than ordinary loopholes. They are generally quite easily recognized. Occasionally the machine guns are in a little separate work which is quite characteristic.

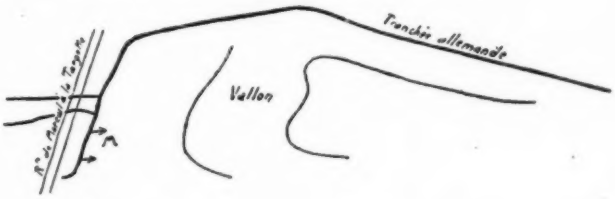
Even when they cannot be directly observed, machine-gun emplacements should be pre-supposed in locations such as the following:

1. In a re-entrant in the line.

2. On the second line, particularly when it presents an elevated position permitting a tier of fire over the first line.



3. Squarely in front to obtain a flanking fire; in this case, they are found in a small *boyau* (branch trench) which leaves the principal trench, and it is very difficult to see them from the front.



Thus, in front of La Targette, in studying the position in profile and having moved considerably toward the right for that purpose,

I discovered a machine-gun emplacement which completely enfiladed the front of the German trenches for 600 metres.

One generally believes he recognizes a very large number of machine-gun emplacements; but it is of infinitely more value to mark the position of too many than to overlook one of them; moreover, the Germans have in their defensive organization an unsuspected number of them.

Means of Destroying the Machine Guns.—Machine Guns of the Trenches.—In the course of preparation by artillery, a very distinct part of the program is reserved for the destruction of the machine-gun nests. The destruction of the machine guns should not be commenced as soon as they have been located, that is to say, often several days before the final preparations, for the enemy would have ample time to shift them. The 75 is employed to destroy the machine guns. Unfortunately, on account of the dispersion, it does not perfectly fulfil its rôle; its shots often fall to one side and a great number of them are often necessary to find exactly the small space that holds the machine gun.

I recollect that before the attack of May 9, I fretted with impatience and went continually to find the artillery observer, as I saw an accursed rectangular loophole obstinately remain intact up to the end. When we started forward, fire burst out from this loophole, and two sections were wiped out.

To destroy these machine guns, there would be needed not only cannons placed at 1,500 metres, which have many other tasks, but cannons placed in the trench itself. The *mountain 80* seems to realize the desired conditions of effectiveness and mobility. Hidden in the trench before the preparation, it unmasks itself during that operation; it takes under direct fire like a rifle all the machine-gun shelters successively, occupying itself with those alone and not leaving them until they are all completely out of action.

Destruction of Machine Guns That May be Set up outside the Trenches.—On the 9th of May, the survivors of my company and of the adjoining company, about eighty men, arrived at 11 o'clock[6] about 200 metres from the cemetery of Neuville-Saint-Vaast. The cemetery being unoccupied, the field of battle seemed void of Germans. In the distance, the batteries were fleeing. Two machine guns remained in the mill; this was the only resistance over

[6]The assault commenced at 10 o'clock.—TRANSLATOR.

an immense space, but it was sufficient. Impossible for my men to advance; we signal the fact with difficulty to the artillery, which from this time on is under open field conditions; it opens fire a long time afterwards and mistakes the objective. Then before the eyes of our furious men, abandoned by all because they were too far to the front, the cemetery fills up with Germans. Four hours afterwards, the 146th appears on the field and is mowed down by the machine guns; the next day the 229th succeeds it; new repetition with a slight and extremely costly advance.

With these machine guns revealing themselves thus without our being able to foresee their emplacement, and taking up positions to stop our progress in a region no longer familiar to us, we must have the means of suppressing them instantly. The field artillery is too far away; communication hardly exists after passing beyond the extremity of the telephone lines. The question is of the greatest importance and merits study. It would be absolutely necessary that the first waves of attack be followed, after the taking of the first lines of trenches, by light guns, the 37 for example, drawn by their cannoneers. These independent crews would be all eyes and ears to discover the machine guns and destroy them immediately. There are enough officers or non-commissioned officers of artillery to command them intelligently.

III.

Form of Attack.[7]

To create a complete gap, it is necessary:

(*a*) *To take the first line of the hostile defense* (*zone of the first trenches and centers of resistance*);

(*b*) *To take the second line of defense;*

(*c*) *To prevent the enemy from reestablishing a barrier by the aid of reinforcements brought up in haste beyond the zone already fortified.*

To overcome successively these difficulties, one must have:

(*a*) A first line of attack composed of several waves of assault with (as an element of preparation) a formidable artillery (field, heavy, and torpedo guns) minutely regulated.

(*b*) A second line of attack as strong as the first, except perhaps in front of the centers of resistance, sent straight to the front all

[7] See Plate I at end of this article.

in one piece exactly like the first line. The same precise and effective artillery preparation is not here present, but it is compensated for by groups of light guns and machine guns destined rapidly to destroy all resistance. Accompanying batteries (*batteries d'accompagnement*) start as soon as the first trenches are taken.

(*c*) A reserve without initial assignment, destined to reinforce any point and conquer any irreducible or hindering resistance. This reserve is entirely at the disposition of the superior commander, while the first and second lines are no longer in his hands after they are in their parallel of departure. On the 9th of May, this reserve was made up of the troops which should have normally composed the second line of attack, which did not exist. This explains the disastrous delay of its engagement, which was furthermore very hesitating, because it tried to maneuver before having broken through and waited for the mêlée to clear away in order to maneuver.

(*d*) Cavalry, auto-cannon, auto-machine guns, battalions of infantry on automobiles with pioneer crews to clear the roads.—Large units, ready to commence new combats, capable of being brought up within two or three hours.—*Do not, after the hole has been pierced, depend any longer upon the regiments who made it.*

RÔLE OF THE FIRST LINE.[8]

Its Method of Action.

The first line is composed of two or three waves. The features of the assault vary according to the distance to be crossed in getting at the enemy.

Distance Less than 100 *Metres.*—The first wave, composed of entire companies in line, the men at half-pace interval, rushes to the assault without pause as soon as the artillery fire ceases. It should endeavor to reach the enemy before he can get out of his shelters. It does not generally have to fire, except perhaps at the last moment to cross the entanglement if the enemy opens fire (see second case).

Distance Greater than 100 *Metres.*—Attack by waves of companies, in which those in front are divided into two parts:

1. A line of skirmishers at 5 paces, formed either by one section

[8] See Plate III at end of this article.

deployed or by groups of skirmishers furnished by each section (calm and resolute men).

2. Fifty metres behind comes the line of attack, men in one rank, elbow to elbow or at one pace; the company and section[9] commanders in front of the line; four metres behind the line of attack, the rank formed by the file closers.

In this case, one cannot count on surprising the enemy; he will open a more or less violent fire, especially during the crossing of the wire entanglement. It is very illusory to imagine that any company is stoical enough to allow itself to be fired on at point blank without replying when it distinctly sees the enemy; it will be necessary to open fire, and this will throw the assaulting line into disorder.

The thin line of skirmishers is intended to give this protection by fire in order that the line of attack may keep its elbow-to-elbow formation without firing until almost the last.

At Neuville-Saint-Vaast, I was obliged personally to act as a skirmisher, and I have since then strongly felt that something was lacking in our line of attack. We arrived at the first entanglement at 80 metres from the enemy without firing, but there on account of the violence of the adverse fire, our fusillade broke out. I myself recall that I marched straight ahead under the protection of my rifle. Every time a "flat cap" raised up and aimed at me, I threw the rifle to my shoulder rapidly; my shot came near enough to make him duck; I profited by this short respite to advance into the wire or dash ahead some 20 metres, always watching and firing whenever a "flat cap" reappeared. Thus, emptying the magazine on the march, I was able to mount the parapet of the German trench without having permitted the enemy to fire a single aimed shot at me. If the man who marches unprotected in the spaces swept by bullets scorns the danger, the one who is sheltered is inclined to exaggerate toward the side of protection, and the men who are in the trenches when the bullets pass cannot keep from instinctively ducking. It is a sensation which the attack should take advantage of.

The skirmishers should be calm and résolute men, and good shots (often old reserve soldiers, well seasoned and less susceptible

[9]The French company has four sections, but no platoons except for administration.—TRANSLATOR.

of losing their nerve and intent upon preserving their own lives).

They should each march upon a particular point of the hostile trench and watch it closely. They open fire only when they get the order from the company commander marching between the two echelons.

This manner of making the assault strongly resembles that brought out by De Wet in "Three Years of War." It is the individual assault where each soldier shows himself as a real fighter.

The March on the Line of Attack.—Each echelon starts out successively at a single bound and moves at a walk (even in cadence, if it were possible). It is curious to observe how much this pace conduces to cold resolution and fierce scorn of the adversary. At Neuville, *all units instinctively started at a walk.* Afterwards take the double time at slow cadence, in order to maintain the cohesion; make several rushes, if necessary, of 80 to 100 metres. They should not be multiplied, at the risk of breaking the *élan.*

When a great effort has been made to scorn the fire of the adversary, it should not be destroyed by a change to an attitude signifying fear.

At 60 metres from the enemy, break into charge.

The Alignment.—To march in line is a capital point, the importance of which one must have experienced in tragic moments to tell how prodigious is its influence. Moreover, the march in line is as old as war itself. The alignment holds each in his place, carries along those who hesitate, holds back the enthusiasts, and gives to everyone the warm and irresistible feeling of mutual confidence. At Neuville, we marched at first at a walk, then at a slow double time, aligned as on parade. I constantly heard behind me through the rattling of the machine guns, the epic, splendid shout of supreme encouragement running all along the line, "Keep in line! Keep in line!" down to the humble reservist, C, who in spite of the bullets making gaps all about in the ranks, kept all of his young and agitated comrades on the line.

Thus rushing like a wall, we were irresistible.

Crossing the Wire Entanglements.—From the moment the entanglement is reached, the period of charge and individual combat begins. The men can no longer be kept from firing; each one tries to protect himself with his own rifle.

At Neuville, we arrived at a first entanglement at 80 metres

from the trenches almost in line and without firing. At the entanglement we lay down, and fire was opened; each one crossed the entanglement individually, lay down on the other side, and recommenced firing. The line reformed without interruption of fire. I then wished to cease firing in order to charge, but they did not hear me. Then I stood up, ran alone toward the enemy, and seeing me thus, the company immediately arose and dashed across the second entanglement.

Taking the Other Trenches.—The first trench taken, it should be cleaned out, not a man capable of doing harm should be left behind; it will not do to leave to others, for instance to the grenadiers, the task of destroying those who can still harm us. At Neuville, we crossed the first trench in one rush and marched on without stopping; it was then that we were shot at from behind and obliged to turn back to massacre them all.

The first trench conquered, the line should be reformed lying down ten metres beyond the trench. Each man arriving on this new line should open fire against the defenders of the second trench. When the line is reformed, it should start the attack again as before.

The following trenches are crossed without interruption, always advancing.

For the first wave, *there is no limit;* let it go through as far as possible. On the 9th of May, the first line ran without stopping as far as the cemetery of Neuville, La Folie Woods, and the first houses of Souchez.

The second wave should start forward at the moment the first line reaches the hostile trenches. If it starts sooner, it will unite with the first at the entanglement and be involved in the fight for the first trench; it will be broken up prematurely, and from the moment that it is no longer a separate mass, it cannot be considered as a reinforcement.

While the first wave drives straight ahead, and can do nothing against the surprises of the enemy, the second and third waves, warned by what happens to the first one, can thus take certain precautions without diminishing their *élan*, such as obliquing the sections that would be exposed to the fire of machine guns not yet out of action.

The reinforcement by successive waves of entire companies leads to a vexatious mixture of units. It is necessary that the

surviving officers and noncommissioned officers group around them men of their own company but not miscellaneous units.

Instruction of the First Line.

The assault being the most severe phase of the combat, it is necessary, in order to face it and push it through, that the will of each individual be transformed largely by habits and reflexes. Therefore, hold each day an assault exercise over ground which resembles in detail that over which the real assault will have to be made.

The points which should be borne in mind are as follows:

The Alignment.—Be particularly strict on this question; its extreme importance is recognized. See that the line is extremely well dressed during the execution of the rushes.

The Charge.—The company, kept in line, is thus led to a short distance from the enemy and there released. Then all together along the whole line, lower the bayonets to the height of the waist; this has an extremely impressive effect.

The charge should be frenzied and furious, and this the men should well understand.

The File Closers.—The file closers should form a rank four metres behind the line, repeating the commands, watching especially the alignment, and maintaining each man in his place by calling to him by name. One can hardly realize the effectiveness of these personal observations in the midst of the bullets. We have no file closers; our noncommissioned officers have a general tendency to run out in front like the bravest soldiers to get into the individual fight, forgetting their men; their training and duties as file closers should receive constant attention during the exercises in the assault.

Taking the Next Trenches.—Pursuit over Free Ground.—Generally in assaulting exercises, everything stops after the first trench is taken; everyone is out of breath, and only a few men here and there, generally noncommissioned officers, try to push on shouting, but soon, being absolutely alone, they have to lie down panting and spent. This is always what happens in our battalion exercises.

The exercise means nothing unless there is impressed on the mind of everyone the deep-rooted idea of routing all the defenders in one sweep. Each man should know that after having crossed the first trench, he should go on a few paces, lie down, open fire

on the hostile groups who occupy the second trench, then get ready to start forward as before, and charge again with the same vigor in spite of fatigue.

We always did this in our exercises, and it was done the same way on the 9th of May. I know men who were shot in the back by German wounded after having crossed the first trench to reform beyond it as had been prescribed. In spite of frightful gaps, a line of men kneeling was, however, reformed, beyond the conquered trench and by its fire drove the defenders of the second trench back into their holes.

As long as there remains a trench to conquer, *prohibit absolutely all advance through the boyaux* (communicating trenches); always reform in line. But the trenches having been taken, the zone of open ground is reached where the enemy will try to reestablish some resistance here and there; it will be necessary to advance with more precaution *and to try and creep through inside his lines and throw him into disorder by surprise*. Form in each section patrols, each one having at least one noncommissioned officer; they should be trained to start out spontaneously as soon as the defenses of the enemy have been passed, and to spread out in front of the company, trying to creep through the *boyaux* to get possession of important points without being seen. These patrols, equipped with revolvers and grenades, should be practised in exercises involving combats in *boyaux*.

Skirmish Formation.—In close combat, men fight much more by shooting at point blank and very often from the hip than with the bayonet. The man should therefore be trained to use his rifle in close fighting.

First teach him to watch that part of the parapet and the loop-holes on which he marches in order to forestall the shots of the enemy; then to aim rapidly, throwing the piece to the shoulder to get the first shot at the enemy who is aiming at him; begin by bringing up the piece and aiming slowly, and then increase the rapidity of movement; the man should observe each time where his line of sight strikes. He should have his magazine filled for hand-to-hand fighting and know how to refill it lying down or while running. Thanks to this precaution, after having emptied my magazine at the first entanglement, I was able to hold my own with full magazine against three Germans who got in my way.

RÔLE OF THE SECOND LINE, THE "REINFORCEMENTS."[10]

Its Method of Action.

The most important question concerning the penetration of the enemy's line is perhaps the action of the reinforcements (***renforts***), and as that action has always fallen short, we have never been able to attain the victory which has seemed so nearly within our reach.

The inertia of the second line and its expenditure without effect arise from two causes.

To take the first trenches is a task relatively easy; the artillery preparation is minutely regulated; the terrain is well known, and the attack is therefore free and open and is pushed through without reservation. But when the first lines have been crossed, one enters thenceforth into the domain of the unknown, one is on the lookout for ambushes and apprehends an unexpected trap at each step; this disquietude slows up the march and quickly transforms into a surprise the least activity of the enemy. A resistance which starts up suddenly intimidates and paralyses the second line immediately, because the fear of the enemy leads to exaggeration of his strength and the mental disturbance prevents locating and estimating him rapidly. In addition, the reinforcements have during long hours of waiting been subjected to a very demoralizing artillery fire.

All these causes so influence the second line that when it goes into action, it attacks without spirit and soon stops.

The second cause arises, as I have previously mentioned, from a faulty conception of the action of the second line.

In place of having a second line of attack analogous to the first, coming into the fight in one body and marching straight on to the assigned objectives, the superior commander uses these troops as reinforcements, which he throws in at the point where he judges their employment necessary. *Now it is impossible for this commander to see clearly in the mêlée, he must wait a long time for the situation to unravel, and as it is necessary for him to be properly informed to send in his reinforcements opportunely, they always arrive too late.* Having generally received orders which are ill defined

[10]The word reinforcement (*renforts*) is defective for designating the second line, but it is the current and popular word that is used among the troops to designate whatever comes after the first line of attack.—See Plate IV at end of this article.

and not having been able to prepare beforehand for the rôle that falls to them, their attitude is necessarily weak and hesitating.[11]

It is absolutely necessary to keep pushing on in a brutal, preconceived, and almost unintelligent manner until the last link is broken, otherwise hostile reinforcements will suddenly arrive and shatter the supreme effort.

Choice of Troops for the Second Line.—This line being subject to the severe trial of bombardment and of the rifle fire directed on the first line sweeping the ground behind, and being obliged to act with as much decision as the troops of the first line, it should be particularly well officered and be composed of troops of excellent spirit; now it often happens that less reliable troops are placed in this line, and far from pushing the first line forward, they stop short of it.

Location of the Troops of the Second Line. The Moment for Putting Them in Action.—During the preparation, the troops of the second line wait their turn in the shelters which open into the approach *boyaux*. It would be very advantageous if they could be placed as close as possible to the parallel of departure[11] in order to profit from the more or less complete protection against hostile artillery fire which comes from being close to the hostile trenches; but in general this will not be possible, except where the German and French trenches are separated by a considerable distance; in this case, there will be enough space between the parallel of departure and the old trench to install several support trenches.

[11] The author's language may not be clear, but the point he wishes to bring out is that the first line of attack, consisting of several waves, will be entirely occupied in taking the first zone of defense; then and not until this is almost accomplished will the second line, complete in itself, like the first line assault over the same ground, each unit as in the first line having a pre-arranged objective; this second line not to be used by the superior commander for any but the preconceived program. Behind this second line are held as reserve other bodies of troops under the direct orders of the superior commander for employment against any resistance that the first and second lines have failed to take. Behind all this are the general reserves, several hours in rear, ready to march through the breach to the pursuit and to new battlefields beyond.—TRANSLATOR.

[11] When an attack is planned, numerous saps are run out to the front from the main firing trenches. The night before the attack, a parallel is broken out connecting the sap heads, and this parallel is amply provided with short ladders. Just before the artillery preparation is to cease, this parallel is filled with the companies detailed for the assault, and as the artillery ceases, the waves rush in succession up the ladders and to the front. Thus the name parallel of departure. Of course, to provide for the successive waves, not only the parallel, but the saps and the main trenches are filled with men who move up into the parallel as fast as room is made.—TRANSLATOR.

When the first line has entirely departed, the units of the second line take their place in the parallel of departure and form there. *While not waiting there too long, it is absolutely necessary that the second-line troops entirely separate their effort from the effort of the troops preceding them.* They should start forward when the latter have almost taken the first zone of defense. A premature departure would mix their action with that of the first waves, and they would be absorbed in the same combat. Thus prematurely consumed and broken up, they would be incapable of continuing their action and would add nothing to the effort of the preceding troops.

Taking the Formation for Combat.—The units of the second line should take their combat formation from the parallel of departure and from there be oriented on a well fixed objective; in fact, they risk coming unexpectedly under fire and should be ready for it at any time. There is, moreover, a reason of a moral order for it, which has been very often tested out. When taking the formation for combat, that is to say, when getting ready to fight the enemy before even having seen him, it seems that each one becomes imbued with a cold and silent resolution, which is alone irresistible. Taking formation under the pressure of danger, however, seems more like a check, and there comes out of it a demoralizing sensation of sudden fear and disorder.

Formation.—The conditions which the formation should fulfil are the following: to be supple in order to adapt itself immediately to the exigencies of the situation; to be as invulnerable as possible so that it may escape the effects of a sudden destructive fire.

For a company, the formation seems to be that of two lines about 150 metres apart, the skirmishers three or four paces apart, the company commander marching between the two lines so that he can see what the first line sees without being entirely involved in its combat.

The march has been generally conducted in small columns at deploying intervals, as it seems that this formation is the more supple and permits of a better utilization of the terrain. This is true only in time of peace, but in war one must deploy a long time before the bullets arrive.

March and Use of Ground.—Each company marches *at a walk* straight toward its objective and *in line* as long as it is not subjected to direct fire; it thus avoids the irregularities which arise

from the anxiety to make use of the ground, when from now on, only one anxiety should prevail, that of routing the enemy.

There is generally a tendency to try to make use of the hostile *boyaux* and trenches as lines of advance. Even if they do permit approach by surprise and without loss, they divide up the company and break the formations for attack; furthermore an extraordinary difficulty is experienced in leaving them when the bullets whistle and the moment comes for getting out on the open field.

I shall always remember Fonquevillers, where I persisted in following with my company a narrow approach which brought me near the enemy, and I know that we had much trouble in leaving it. I have often thought since that it would have been preferable to take a combat position in a hollow road a little further to the rear parallel to the enemy's front, at 400 metres.

Combat of Units of the Second Line.—The units of the first line, having made their effort, have been finally stopped on the whole front by a series of resistances. The troops of the second line have received as their mission only the two following objects:

To master a well-defined zone up to a certain point;

To master the borders of a center of resistance on the flank of troops that have pushed into the intervals.

Eventually they may at certain points receive the order to throw back a counter-offensive and to pursue.

When the troops of the second line arrive in the proximity of the troops of the first line who have been stopped, there should be no idea of maneuvering nor of consultation, but as in the case of the first enemy trench, they must carry through *the assault without hesitation.*

Two cases are presented according to the distance that separates the fractions of the halted first line from the hostile resistance:

1. Distance less than 200 metres:

If the stopped first line can maintain itself at the limit of its progression, it is generally not in an open field. Its line will serve as a parallel of departure for the units of the second line. These units at first try to reach the line of shelter where they will be formed. Their assaulting formation results from the march formation, and the waves will be composed of half companies.

The first wave rushes out of cover at the double to at least half the distance and opens fire; fire being opened, the second wave rushes *in line* and carries along the first.

Here the firing cannot be prevented, as artillery support, now faulty, has to be replaced by rifle fire, to which is joined the fire of machine guns and light cannon, which alone can make possible so fearful an assault.

2. Distance more than 200 metres—Progression and Assault:

The new difficulty is to build up at assaulting distanee from the enemy a line of assault in a sort of parallel of departure.

To arrive at assaulting distance, advance by thin lines formed by halving the skirmish lines already deployed; these lines, at least 100 metres apart, advance successively by alternate rushes, then unite on the line designated as the starting point for the assault.

A natural parallel of departure may exist or may partially exist, or it may not exist at all. In the second case, the line of shelters must be adapted, and in the third case it must be created in order to be able to stay a few moments at a short distance from the enemy without being destroyed. To facilitate this extremely difficult and dangerous construction, it is a good thing to have each man fill a sand bag at the last shelter and put in some stones, which, while not bulky, stop the bullets. Each man makes his rushes with his sand bag, which protects him partially during the halts. Having reached the line fixed upon for the parallel, this sand bag serves him as a cover, which he has only to complete rapidly. Each man then enlarges his shelter so as to accommodate near comrades.

The first wave, reformed at the assaulting distance, makes the assault as before. At times, the losses and the confusion of units may lead to an assault by entire companies.

The second and third waves follow and imitate the movements of the first.

Machine Guns and Light Cannon.

The artillery can only give the second line a support which is often partial and not very effective; its action must be replaced at whatever cost by other means, such as machine guns for sweeping the hostile firing line and light cannon to instantly destroy the hostile machine guns.

Location of the Machine-Gun and Gun Crews during the Assault.—These detachments follow the last waves of the first line, and they therefore are not directly taken under fire and can profit by the

indications of the fight of the first line and so be in a way to act effectively when the second line comes into action.

Machine Guns.—The machine gun is an element of attack and the most terrible arm of close fighting. However, it is employed in the attack only to man the positions taken or to support the infantry elements from a distance. This is nonsense: to give it such a rôle, one could never have trembled with rage and impotence at a few paces from the enemy, whom he could not get at.

The machine gun should be pushed as far as possible in front of the halted line of fire. If it remains behind or abreast of the fighting line, its field of fire is generally blocked or masked by the slightest movement; in advance of the line, it will enable the infantry line to advance for some time under the cover of its fire; it is the tooth of the attack. It can move forward, its crew of a few men can creep along the smallest pathway, and a shell hole is sufficient for its shelter; in the skirmish chain a whole ditch is necessary. Will it lack ammunition, having only the boxes that the gun crew carries sometimes incomplete? No, for it has only to fire on rare occasions, for example, at the moment of assault. If it is taken, what does that matter—we will take ten from the enemy. The problem would be much simplified *with a few automatic rifles.*

Light Cannon.—We have spoken of the rôle of light cannon in the paragraph relating to the destruction of machine guns.

Instruction of Units of the Second Line.

This instruction proposes to create the reflex of immediately attacking all resistance that appears and of developing presence of mind by inventing sudden incidents requiring the taking of a rapid decision. In a word, to add a spirit of prompt decision in the troops of the second line to the irresistible *élan* which one tries to develop in all assaulting troops.

The troops of the second line when facing a resistance should have only one idea: to assault as soon as possible and for that purpose to try to bring about the two following conditions:

To create a sort of parallel of departure at assaulting distance;
To obtain superiority of fire by all means at their disposal.

We will study by means of examples the two preceding cases cited. Troops of the second line should know them by heart, because all cases resemble them more or less.

First Case.—We reach the first line, halted under cover at 150 metres from the enemy; this is a case of organizing a long-distance assault.

Attention should be focussed on the following points:

1. Re-establishment of Order and Calm.

The line of cover is an extemporized parallel, the men are crowded into uncomfortable positions, several units are mixed. These are conditions likely to create disorder, the worst enemy of the assault. Think well as long as you are under cover because amid the bullets you march straight ahead without thinking. Transmit simple indications from man to man and orders to the chiefs of section by note.

Have all cease firing except the best shots; firing unnerves and distracts the noncommissioned officers and soldiers. On the contrary, silence is at once a mark of order; it impresses the men who collect themselves and make the appeal for a supreme resolution to their inner selves.

2. Gaining Superiority of Fire.

It can be obtained in the two following ways:

The execution of an intense fire by the whole line;

The execution of a slow, deadly, and precise fire by the best shots, well concealed.

The men are under cover, consequently it is possible to avoid the first plan, which is noisy and not particularly effective but which circumstances beyond our control sometimes make necessary.

The best shots are designated by the chiefs of section. They construct masks in front of themselves, behind which they fire obliquely, that is to say, under excellent conditions of security and calm. They locate an adversary, keep aiming at him and firing each time that he appears, and they go successively from right to left. This method is very effective; the enemy does not dare to fire any more, and it soon seems as if his trench were empty.

In addition, if possible, get a small group to the front or on the flank, who will protect a forward movement by their fire.

3. Execution of the Assault.

"The first and second sections will move out under command of Lieutenant X and will make a rush of 80 metres. Open fire after the rush."

The movement should be simultaneous and without warning to the enemy; the following suggestions are made:

"Prepare to rush, look toward Lieutenant X, hide your bayonets."

The movement having been executed by the first echelon and fire opened, the second echelon rushes in its turn, aligned at a quick pace, then at double time, and carries along the first.

From the moment of the charge, each man rushes on the enemy and fires if necessary.

Second Case.—The units of the first line have been stopped at more than 200 metres from the enemy, say at 500 metres.

Move forward, executing short, rapid rushes without firing, in thin lines which are united at assaulting distance from the enemy.

The formation of successive lines for rushing is extremely simple. The company having arrived at a sheltered line beyond which extends an open space, the company commander commands:

"In thin lines by half section, at 100 metres distance by short rushes: 1st and 3d Sections, forward."

He personally goes out with the first line to select the emplacement where he will halt it.

Each of the 1st and 3d Sections sends out two squads (1, 3, 9, 11). The men immediately take 6 pace intervals. This forms the first line, which is followed by a second, and so on, the rushes of each line alternating with those of the preceding one.

The construction of the parallel of departure is accomplished as has been indicated above.

Instruction of the Machine-Gun Sections.

The machine-gun sections should participate in the exercises with the infantry. They should be accustomed to grasp the idea of the situation rapidly and to replace the fire of the attacking infantry either by taking a position in rear or on the flanks which will permit them to fire up to the end of the action without being hindered by the movement to the front, or by going squarely out in advance of the halted line.

This last case should be particualrly studied; the Germans have shown it to us, and it is therefore possible; I know that it is very effective (25th of August at Crevic).

Therefore train them to get used to picking out cover, however insignificant, as a position for a machine gun and to utilize the

ground skilfully and rush rapidly with the matériel in order to make themselves invisible or indiscernible;

To arrange shelter rapidly, to create a mask in front, and arrange for oblique fire, in order that the personnel may not be rapidly destroyed;

To keep still and try to be forgotten until the moment of assault.

The crews of the light guns should be attached to the infantry and learn to cooperate with it instead of being independent.

Exercises to Develop the Spirit of Decision in the Second Line.

In front of any resistance whatever, the units of the second line should have but two ideas:

To take positions rapidly for the assault;

To assault.

The dispositions for the assault are:

The creation or adaptation of a line of a shelter at assaulting distance;

The rapid gaining of superiority of fire.

All the work of maneuver is reduced to the realization of these two ideas. It is a question of applying in slightly varying circumstances the two classic studies above indicated, and one should know them perfectly.

To develop presence of mind in the noncommissioned officers and suppleness in the organization, situations analogous to those formerly used on the drill ground such as, "Cavalry to the right—in rear" should be devised.

Choose a parallel of departure and have the troops of the second line take their formation and march on the objectives designated in advance. Suddenly call out, "Enemy resistance on such a line, our first elements are stopped at such a point . . . hostile machine guns in such a region." Then everybody, infantry, machine guns, light canon, instantly take up their dispositions.

By representing the enemy and having him fire blank cartridges, one becomes accustomed to making rapid reconnaissance of resistances.

IV.

Preparation of the Troops for Penetration.

The battle of today, since the last evolution of the war, is only a succession of assaults. The assaults being the hardest and

most murderous phase of the combat, before which the attack generally breaks down, we should only undertake it with assaulting troops. All troops are far from being assaulting troops; they need a well established cohesion and a special training.

In nine months of campaign, I have only twice had a company really capable of delivering the assault: that of the active regiment, which was eager to charge at whatever cost at Morhange, and that of Neuville-Saint-Vaast, toward which during the assault, I turned but twice—when we started and when I fell.

THE COHESION.

In order that an organization may be capable of reaching the enemy, it is necessary for each man to be thoroughly convinced that his neighbor will march at his side and not abandon him; he should not have to turn around to see whether his comrade is coming. This requires a solidly established cohesion. Cohesion is very difficult to obtain with the continual renewal of men and noncommissioned officers; to cement it well, the men must have lived long together and have borne the same hardships during which are strengthened the sentiments of solidarity and affection which create in the company invisible bonds, stronger than all discipline and the only ones capable of resisting the fierce egoism of the battlefield.

The company must also have been tried out by experiences severe enough for everyone to be able to estimate what his leaders and neighbors are worth under circumstances where borrowed masks fall off. Thus habit, friendship, and confidence make no difference in the appearance of a company; it is the battle alone that unveils these qualities in their full staunchness and value.

The company of the 9th of May had been in existence at least four months, that is, the last considerable reinforcements had been present about four months. We had indeed received newer recruits, but they were not sufficient to change the spirit of the company. We had lived in the Belgian trench where the material side of the situation could not have been more miserable. Without having suffered serious losses, we had been at times very roughly used, so that all the men had an idea of the trials of war.

Thus trench life is an excellent school for cohesion, but a company which moves forward directly from trench life would not be capable of attacking as we should like. Trench life is deteriorating

and destroys in the mind of the man the idea that be belongs to a unit, to an organization. It should be completed by a period of exercises.

During the period of exercises, the work should be toward cohesion by establishing an exact discipline, difficult to obtain in the trenches, by punctually requiring the marks of respect, and by paying close attention to the uniform and personal appearance. All these details have a prime moral importance; nothing is more demoralizing for the soldier than to see around him his comrades badly dressed and negligent in their duty; he evidently finds at times that this is more convenient but at heart he lacks confidence because he well knows that in this troop of Bohemians, without faith or order, everyone will go his own way in the moment of danger. The daily aspect of a company, carefully uniformed and well disciplined, gives him, on the contrary, a feeling of reassurance and confidence.

> ". . . Mais par un prompt renfort
> Nous nous vîmes trois mille en arrivant au port
> Tant à nous voir marcher en *si bel équipage*
> Les plus épouvantés reprenaient de courage."

This is what our battalion commander often quoted to us.

Combat exercises by entire units, close-order drill, and passing in review which should always close an exercise session, contribute to develop the sentiment, which becomes blunted in the trenches, that the soldier belongs to a unit, compact and articulate.

The trench produces cohesion in the *small group*, the period of exercise the *cohesion in the organization.*

THE OFFENSIVE SPIRIT.

In order to rush headlong at the enemy out in the open, where at any moment shot and shell may do its worst, one must have an exuberance of energy. This increase of courage exists only among troops who have for a long time been able to accumulate reserves of moral force. A unit that has recently made a bloody effort is incapable of delivering a *furious and unlimited assault*, such as we wish for. It might with trouble take a line of trenches and there hastily take cover. The supply of energy is used up quickly and comes back very slowly; the memory of the terrible dangers must be dulled. In a combat, the expenditure of energy is at once physical

and nervous, but rather nervous than physical. Now the mistake is often made of thinking that an organization is in fighting condition when it has again taken on a good appearance and seems in excellent form. A few nights of sleep and a few days of good food are sufficient to restore the physique, but the nerve cells are reformed with all the slowness that is characteristic of them. How many times, some days after bloody fights which have left me weak and emaciated, have I found myself in a state of flourishing health almost shameful for a soldier, and felt at the same time a faltering courage at heart!

To try to attack with troops already dejected or insufficiently recovered is to march to meet a certain and bloody defeat. It is sufficient to see the troops with which the attempts to break through at Neuville in the month of June were made and their result, known in advance by the discouraged officers. The almost destroyed regiments that had made the magnificent attacks of May 9 and had occupied the conquered ground under the worst bombardments until the 25th, had been reorganized with dispirited officers and noncommissioned officers, and were the sorriest soldiers that one could see—men recalled after having been formerly rejected, incompletely instructed, and of rather mediocre spirit. The few survivors of the splendid days of May, instead of being exalted by the memory of these exploits, had retained the memory of the massacre which had left them almost alone among their former officers and two hundred comrades. Two weeks rest and a new attack with the painful result which covered the famous regiments with unmerited shame; companies hesitating to leave their trenches, officers obliged to drive their men, the slaughter of abandoned noncommissioned officers.

Therefore do not attack except with troops that have not made a bloody effort for a long time and who have been able to recuperate their supply of energy.

The second condition under which troops attack without thought of sparing themselves is when they truly feel that the action in which they are going to engage is worth the immense sacrifice of life. Each man down to the most humble feels conscious that his existence is of inestimable value, that it represents many efforts, many troubles, and many affections. The infantry soldier has so many and many occasions to die that he only gives himself up to it on real occasions, and this calm and conscientious

self-denial which irritates those who would like to find the troops ever responsive to their orders is of a supreme grandeur. When one has seen the death and suffering of the soldier at close range, one ties to him as to one's self and does not expose him for every whim. The soldier understands this thoroughly, and when he is told that it is "*pour la Patrie*," he then goes in for all he is worth, and so it is that the chief who has not stormed and fumed in vain is rewarded for his wisdom.

The coming of the generals who know how to talk to the men who will meet their death with simplicity and conviction, has a profound and decisive influence on the open-hearted mass of infantrymen. Handling soldiers was formerly the greatest accomplishment of commanders, who did not confine themselves to the brief and abstract formulas of their orders. *Today as formerly, the word of the great chief, rational and assured, is graven in ineffaceable letters in the hearts of the combatants.* Beyond the chief, the soldier clearly sees his native country, whose supreme will still claims the sacrifice, and in himself he feels his courage harden.

Toward the 15th of April, returning from Belgium, our regiment passed in review before General F, our former Corps Commander, who assembled the officers and said to them: "We are going to attempt a new maneuver . . ., the waiting has come to an end, we are going after them . . ., we have today cannon and ammunition in abundance, we will crush their shelters, we will destroy their machine guns . . . Then the infantry will be launched and will crush them; after the first ones, there will be others . . ., then others . . .; if we do not succeed, we shall have no one to blame but ourselves." These words sank into the hearts of the company officers, and they repeated them with conviction to their soldiers, and the latter heard them so well that they surpassed all that could have been expected; they are not the ones whom General F might blame.

Thus the troops see clearly the object, but the moral preparation would be insufficient if the man felt himself incapable of accomplishing it. Each day the officers should instil in the troops the idea of the effort and show them how it may be realized; there are even questions concerning the instinct of preservation that it is good to bring into play. Thus instead of fearing the ordeal, the man little by little gets accustomed to the idea of facing it.

It remains now to complete and exalt the offensive spirit by an intense period of appropriate exercises. Trench life has a tendency to kill the offensive spirit of the troops. They think only of protecting themselves, they are always under cover, they circulate in the *boyaux*, and all this creates a horror of the open ground. Daily experiences, such as not being able to show one's head without running the risk of receiving a bullet in the face, create a very acute sensation of danger. They dare no longer stir, and to attack the terrible trenches of the enemy which one cannot look at even for a second seems a mad and irrealizable project. The service in the trenches creates terror of the hostile trench.

The Man Must Be Put into Forward Movement

Make him run, jump, and rush in the open spaces; let him get intoxicated with air and movement; the attitude creates the mentality. As soon as he has lost the habit of hanging his head and hunching his back, he has also lost his exaggerated prudence and the fear of unsheltered spaces.

At the cantonments at Fiefs and Berles, where we passed a fortnight before the 9th of May, the afternoons were entirely given up to sport. We organized "field days" in the woods, obstacle races, and the men, recruits and old reservists, galloped through these spring days with absolutely unbounded animation. To give the men the habit of moving without anxiety over open ground where the bullets whistled, I took advantage of the nights when we were working on saps and parallels to make them march in patrols a short distance in front of the lines. If I saw that the workmen were thinking of crouching down, I made them stand up for a while; as for me, I fortified myself by walking up and down in front of the working party.

We wished for an irresistible assault and therefore tried to inculcate in the men the instinct of hand-to-hand fighting, at which they ordinarily hesitate with the result that the close combat is stopped for days and months at a few score meters from the enemy. We had bayonet fencing, but it was a demoniacal fencing, the fencing of the chargers of Froeschwiller.

The fencing exercises, carried out by the company to prepare for the attack, were as follows: first, a brief review of the movements, then immediately fencing on the run; the men were formed

at a few paces intervals and then started on a run; it was "Halt! Thrust! Thrust again!" They started again, climbed the embankments, lunged and relunged furiously; they got winded, so much the worse. . . . "Right face!" and everyone ran to the right, descended the slope stabbing and stabbing again, getting excited and feverish, the officers and sergeants galloping more furiously than the rest.

Afterwards fencing with the dummy. We had stuffed sacks full of straw and made them smaller each day to make a smaller target and oblige the men to be more accurate in their thrusts.

Each man attacked the dummy individually, shouting with all the frenzy of which his imagination was capable, and those who attacked the best, with the greatest *élan*, went over it again to show their comrades how to do it. It was no play, they knew enough of the Germans to believe them in front of them, and I recall that among those from Gascony, Toulouse, and Provence, who formed the basis of the company, some shouted with frenzy, "Piquo, Piquo!"

In order to give more movement, the exercise against the dummy was arranged in the following manner:

In a quite tangled wood, we established obstacles by cutting down bushes over a course of 80 metres. Then here and there we placed the dummies. Thus on a fairly short course the man was obliged to run, jump, bend down, attack, and this in every manner, for we placed the dummies in such a way that the man had to combine his attack with right face, left face, face to the rear, or with crossing an obstacle. This exercise particularly interested the men, and as we measured the time taken by each one to run the course, in a few days it had developed in an astonishing manner their agility and suppleness, and gave nerve to those who had none. I know that as concerns myself the knowledge of having covered the course in the shortest time, in addition to other experiences, contributed greatly to developing my confidence in my vigor and my good legs, which were the most precious of my offensive qualities on the 9th of May.

Afterwards we attacked in groups and then passed to charges by section. Here we sought, while giving the greatest impulsion and fury possible, to maintain cohesion and give to each one the confidence of the touch of elbows, and to the enemy the terrifying impression of a wall that nothing could stop. We marched at

charging pace,[12] aligned, with a lengthened and furious step—not restrained and without conviction—up to 50 metres; then we charged, lowering the bayonets in a single movement to the height of the waist.

We were working to get the charge of the skirmishers and Zouaves at Froeschwiller; now we have had it with loss of the majority of our officers over three successive trenches on two kilometres of a single rush to the cemetery of Neuville-Saint-Vaast.

V.

Material Preparation of the Troops.

The fight does not consist in getting killed but in getting out of it by thrashing the enemy. Therefore do not go at it in a hurly-burly fashion; one should be careless only about the inevitable fatality over which one can have no influence. Let us prepare our business down to the slightest details in order to conquer and live.

KNOWLEDGE OF THE GROUND.

Maps.

Before the attack, the physiognomy of the terrain and of the enemy's defenses should be well impressed on the memory. The position should be known not only from the front but in profile. This study is of the greatest importance, particularly *for the troops of the second line*, because the greatest cause of stoppage in an offensive against a fortified position is the incomplete knowledge of the position. One is afraid, in advancing, of falling into an ambush. The company commanders, particularly those of the first line, should indicate to their chiefs of section the successive points of direction for their sections, so that each one will be aware of the obstacles he will have to cross. The men should likewise know the ground well. I used to require them to study the future sector of attack, giving them the principal points to watch when they went on guard in the trench.

If on the 4th of December we had known the terrain of attack before the night engagement instead of not having the slightest notion of it, we would not have awaited the dawn at the first Ger-

[12]Thirty inches, 140 per minute.—Translator.

man trench for fear of falling into a wasps' nest, and we should have taken not only the second but the third trench and made many prisoners.

Very detailed maps are distributed before the attack to company commanders and to chiefs of section, but one should try to complete them oneself by attentive and repeated observation of one's sector. Before the attack of the 9th of May, I had recopied for each noncommissioned officer the part of my map concerning the zone of attack of the company, entering on it all known information.

Matériel.

Real superiority over the enemy is obtained by superiority of weapons; courage cannot make up for destruction, one must tax one's brain to furnish the men with matériel which may be useful to them.

Grenades.—Every grenadier or member of a patrol should carry five grenades; each man should have one, not to throw himself but so that it may be possible to get a certain number of them together in case of need. If a fight with grenades is foreseen in a region cut up with trenches or *boyaux* or in a town, the supply should be increased.

Furnish suffocating grenades, especially to patrols going into *boyaux*.

Familiarize everyone a long time beforehand, if possible, with the handling of the different grenades. On the 8th of May, I sent 5 kilometres for suffocating grenades, which I had just heard of, in order to be acquainted with the effects of this useful weapon. Have hooks prepared, fixed to the left wrist, for the purpose of lighting the friction grenades by hand.

Revolvers and knives are indispensable for the fight in the *boyaux*.

Have individual sand bags to establish a rapid barrier in the *boyaux* or to build up a line of cover such as we have before described.

Also the Filloux apparatus, with the use of which the men should be familiar.

Equipment.—Keep the lightened knapsack, which will be of service against a possible bombardment of the conquered position (lesson of Langemark, December 4). Fold the blanket on the inside of the knapsack to form a padding against fragments.

VI.

Development and Physiognomy of the Attack.[12]

Action of the first line of attack.

The artillery preparation, roaring on the horizon like a furious storm, ceases sharply, and a tragic silence falls over the field of battle. The infantry leaves its parallels in a single movement, at a walk, magnificently aligned, crowned with the scintillation of thousands of bayonets. Then the hostile trenches burst out suddenly with fire, the fusillade rattles immediately, madly, dominated by the pitiless rattling of the machine guns. The wave of assailants thins out, entire units disappear, mowed down. Some lie down and advance no further, while others, better commanded, march ahead in spite of all. Some, more favored, find themselves in places where the artillery preparation has cleared the enemy out. They reach the first trench, and hand-to-hand fighting commences.

The second wave arrives in its turn, avoids the zone of destruction, plunges into the parts where the resistance has weakened, and thus the first trench, split up into enveloped sections, is definitely submerged by the second wave. They form beyond the captured trench and start forward again; but it is a disorganized combat by groups in the midst of shots and bullets which cross each other in every direction. The second trench is assaulted, certain parts are conquered through which the flood of assailants spreads out while desperate groups resist stubbornly in some redoubts.

Now in the first line of attack, there is no more order, the dead cover the ground passed over, here mowed down by ranks, there hung in clusters on the wire entanglements, or forming a crown on top of the parapets, or sown here and there by the scattering of the hand-to-hand fights; the wounded flow back in numbers to the rear, isolated soldiers are scattered in all corners for the most diverse reasons; even organizations are stopped in the conquered trenches by their chiefs who find that they have done enough and that it is high time to get out of the trouble. But beyond this immense dispersion, some heroic groups, weak nuclei of many companies, led by ardent leaders, make their way further into the

[12] See Plates at end of this article.

hostile territory. They suddenly appear, urged into a gallop over the trenches; magnified ten times by the imagination of the myene who loses his head, they run beyond into the open fields, receiving some shots here and there but surprised at the emptiness of the field of battle. Behind them, the combat of extermination continues in places, but nothing follows, only some groups of stragglers and wounded are returning. Then these foremost parties feel their weakness and count their numbers; the emptiness, the silence, the invisible resistance impress them, they scent the ambush and soon stop.

In front of the centers of resistance, the fight is hard and murderous; they have taken one or two trenches, carried the first houses, but the organizations are dissolved in the interminable individual fighting in the *boyaux* or ruins; here the progress has been inappreciable in spite of enormous losses.

Thus the first line has made its effort; in the centers of resistance, it has scarcely gotten a good hold on the exterior borders; in the intervals, on the contrary, it has expanded widely like a wave which had broken through a dike at one point. But it has been stopped, out of breath, in front of the second line of defense, whose resistance is organizing, or it has been nailed to its place by flanking fire from the still unconquered centers of resistance; it is composed from now on of weak groups of real fighters, just strong enough to mark out here and there the limits of the conquered ground, and of a multitude of isolated individuals and entire units which are scattered over the whole zone of attack.

This has all lasted perhaps less than an hour.

ACTION OF THE SECOND LINE OF ATTACK.

With the enemy all is disorder, the batteries flee at a gallop before the tide which has carried away all the obstacles prepared long ago and judged impregnable; all confidence disappears; the adversary, feeling his resistance giving way around him, no longer dares to hold out desperately, from now on the least thing induces him to turn tail. However, at some points reserves have come up, have manned their positions of the second line, and have attempted some timid offensive returns. Machine guns, rapidly brought up, are installed and fire with utmost rapidity to prevent access to the undefended zones and to gain time. The tottering resistance tries to hold on; now, one more great brutal

push along the whole front like the attack of the first line, and then will come a total rout.

It is then that the second line appears; starting out in its turn from the parallel, it advances by immense and successive waves of thin lines, calm and unshakable among the rafales of shells and random bullets.

Already numerous detachments of machine guns and light cannon have preceded it. Creeping through, following up the first line, they have been able to unravel the situation and to discern the points where the resistance tries to hold out and which must be immediately swept. The light cannon orient themselves directly on the rattling of the machine guns, which they endeavor to overwhelm with a shower of their small shells.

The "accompanying batteries" have started as soon as the first trenches are taken and are soon oriented by the signals of the special *agents de liaison*, artillerists who follow the infantry. The remainder of the artillery cuts off the approaches by a barrier of asphyxiating shells and carries its fire on to the second line, marked out according to the directing plan.

Thus the second line arrives close up to the advanced elements of the first line under cover of sufficient fire. The second line pushes straight to the front on the objectives fixed long before and which should claim its whole attention.

Certain of the units have a mission to blind the centers of resistance by finishing up the conquest of their exterior borders, while the great majority are absorbed in the intervals, instead of halting and exhausting themselves by playing the enemy's game in his inextricable points of support.

To quote an expression of "A Midsummer Night's Dream," modifying it slightly: a center of resistance is a filter into which one can pour battalions and regiments, and it will yield only a few drops.

The organizations passing through the intervals arrive in front of the second line of defense, which is not generally occupied continuously. They run against lively and sudden resistances, or *else encounter empty spaces through which they boldly penetrate*, pushing straight on always to the front without being intimidated by the silence or distracted by the resistance on the right or left. The units stopped rapidly organize the assault and attack by main force like the first waves of the attack without trying to maneuver,

a temptation of weakness and indecision. Here again there is hesitation: units held up by only a semblance of resistance or trying to avoid it; others, having approached to assaulting distance, dig in and dare not go forward openly into a supreme charge; others are turned away from their objective to get into another combat, which absorbs them.

However, the second line of hostile defense finds itself in its turn disabled; broken in and considerably passed by in certain localities, vigorously assailed on all points where a resistance is hastily improvized, it is soon split up into islands and surrounded on all sides.

The points of support, as in the case of the first trench, are left to one side and merely isolated by the capture of their borders.

ACTION OF THE RESERVES.

We are now nearly in open ground; we must still definitely clear away the last resistance to which the hostile reinforcements now coming up in haste would cling and soon convert into an insuperable barrier if we give them a few hours' respite.

It is for this purpose that we employ the reserves.

Informed by officers of *liaison*, who are not afraid to traverse the battle field to find out how things are going on and who do not abandon the troops to their own resources until tardy reports come in, the superior commander directs his reserves to the precise points where they are most needed.

Thus the last resistances, which the second attacking line, occupied with marching straight ahead, was not able to encircle, are definitely shattered by the reserves.

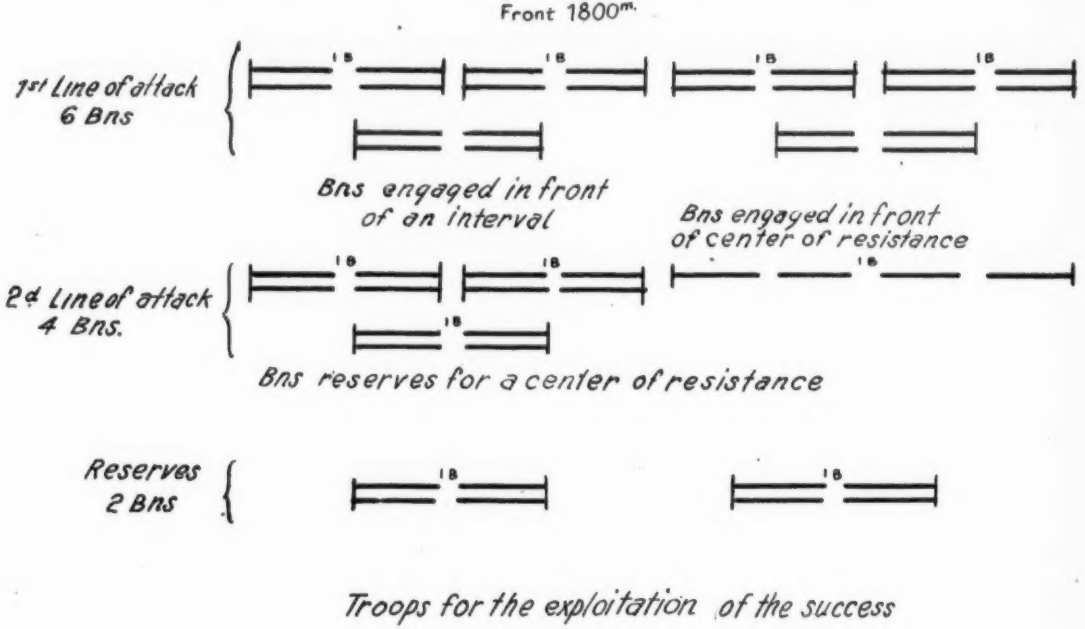
Exploitation of the Success.

Finally, we have arrived in the zone of open country, the gigantic assault of 5 or 6 kilometres is ended. Now it will be the surprise, the rapidity of movements, the skill of maneuver which will gradually produce panic.

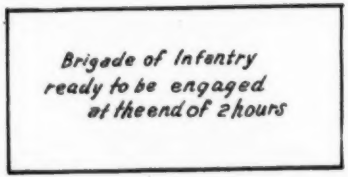
The enemy, pushed back, overthrown, broken through in the intervals between the points of support where he tries to hold on, will soon no longer find a position where he dare make a stand; he will be irresistibly drawn into the rout as the menacing cry "the French!" re-echoes in an infinitely increasing volume.

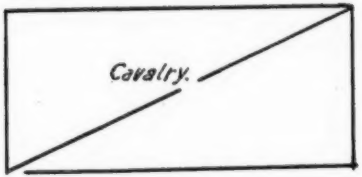
But it will then no longer be a question of breaking through, we must rest after the assault.

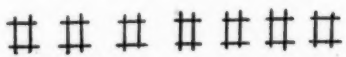
DISPOSITIONS OF THE ATTACKING TROOPS ON THE FRONT OF A DIVISION.


Front 1800m.
1st Line of attack
6 Bns
Bns engaged in front of an interval
Bns engaged in front of center of resistance
2d Line of attack
4 Bns.
Bns reserves for a center of resistance
Reserves
2 Bns
Troops for the exploitation of the success

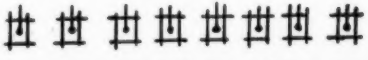
Troops for the exploitation of the success



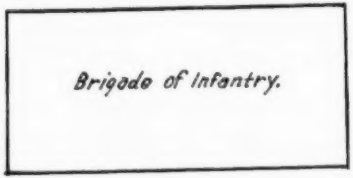




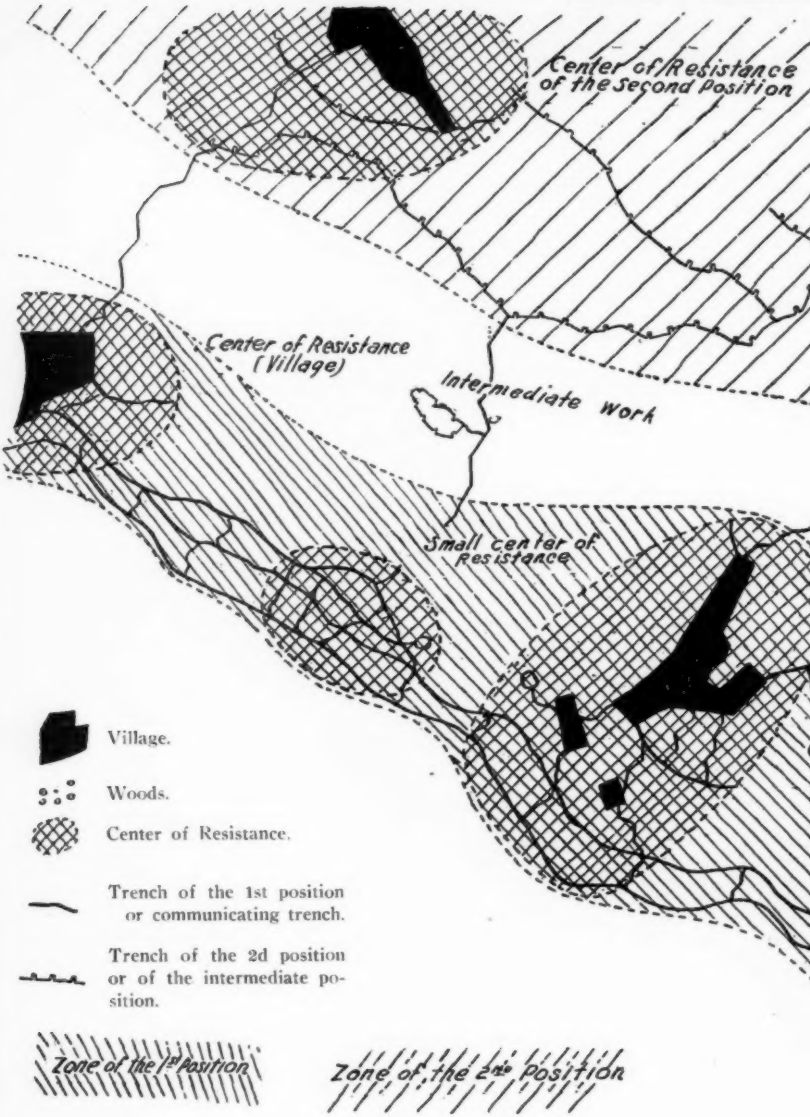
Bns of infantry in automobiles with detachments of pioneers



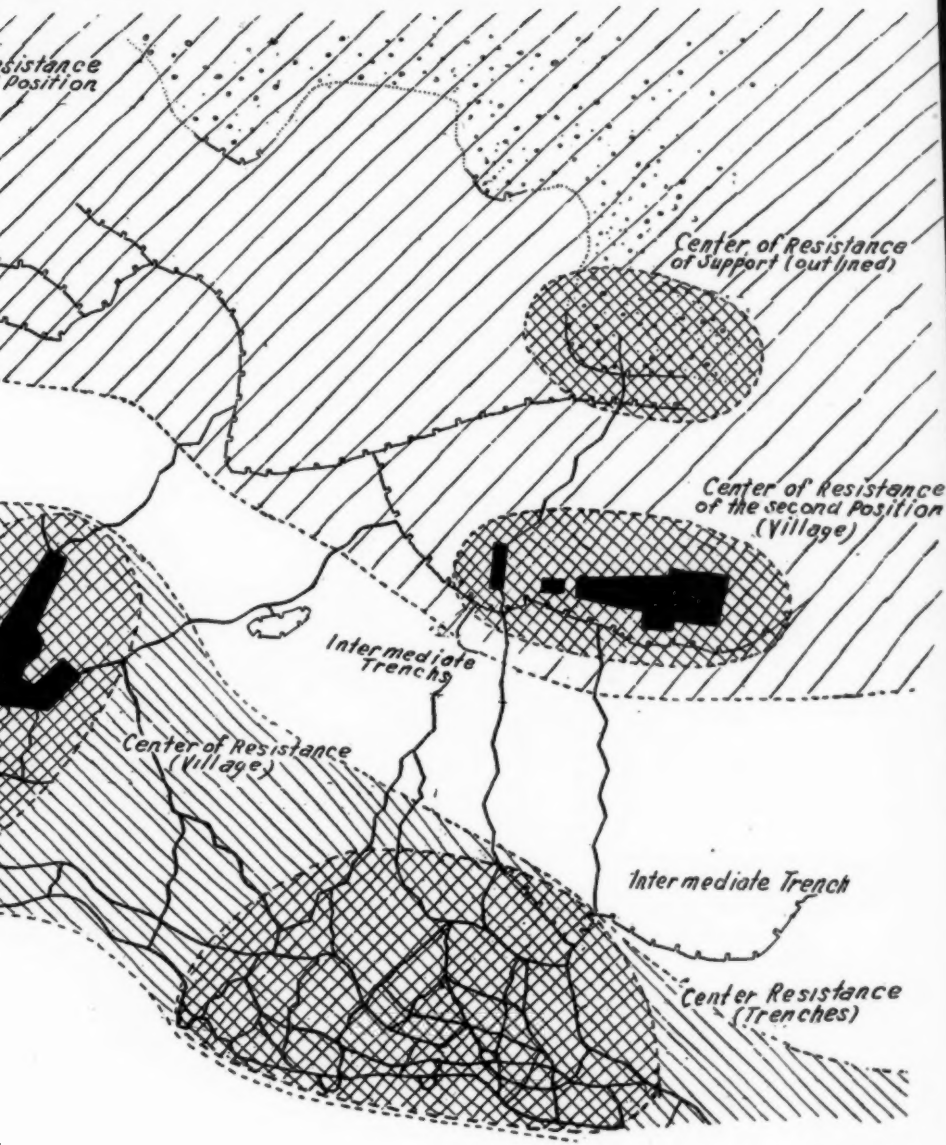
Guns and machine guns on automobiles.



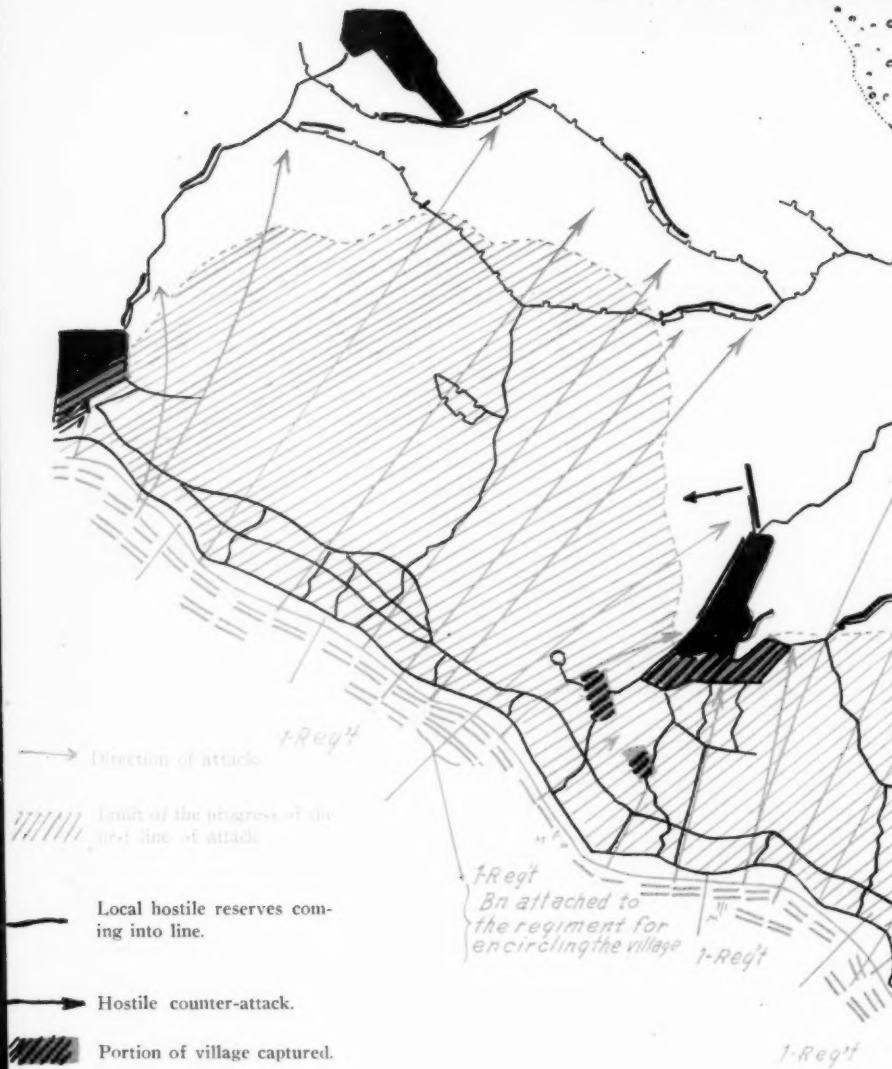
Pl. I.


Center of Resistance of the second position
Center of Resistance (Village)
Intermediate work
Small center of Resistance
Village.
Woods.
Center of Resistance.
Trench of the 1st position or communicating trench.
Trench of the 2d position or of the intermediate position.
Zone of the 1st position
Zone of the 2nd position

A GERMAN DEFENSIVE ORGANIZATION.

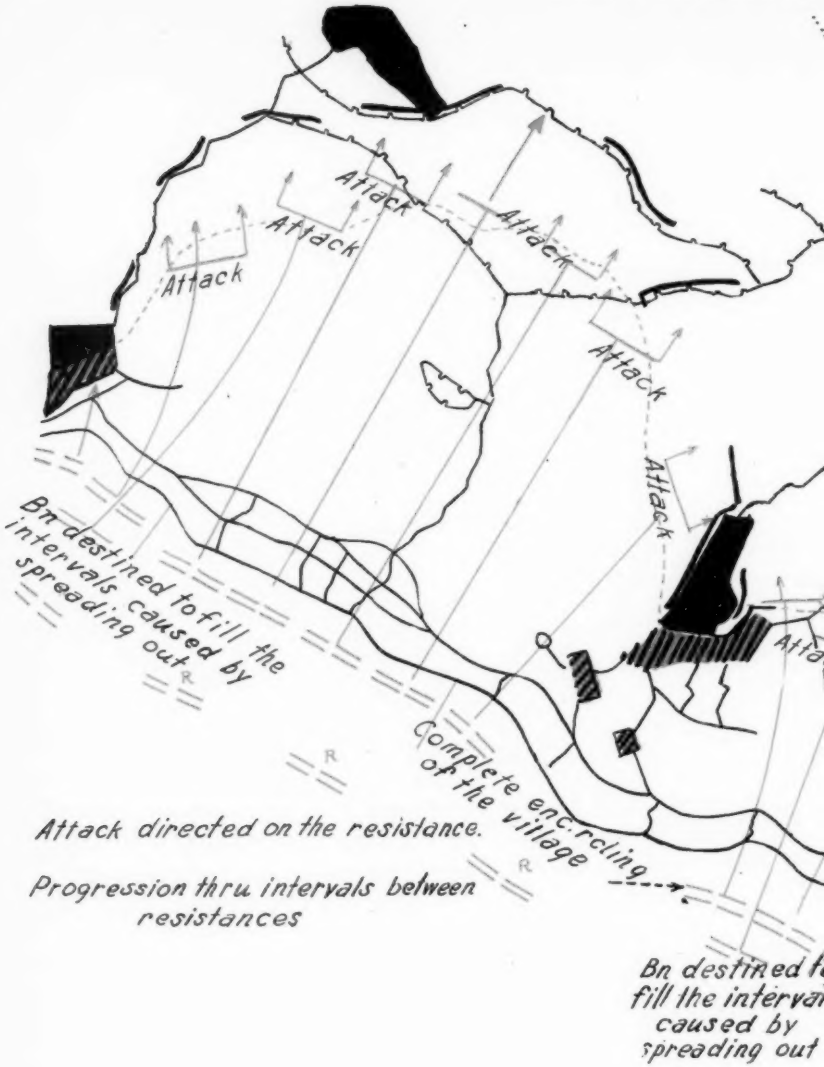


Pl. II.


1-Reg't
Direction of attack.
Limit of the progress of the first line of attack.
1-Reg't
Bn attached to the regiment for encircling the village
1-Reg't
1-Reg't
Local hostile reserves coming into line.
Hostile counter-attack.
Portion of village captured.

T LINE OF ATTACK.

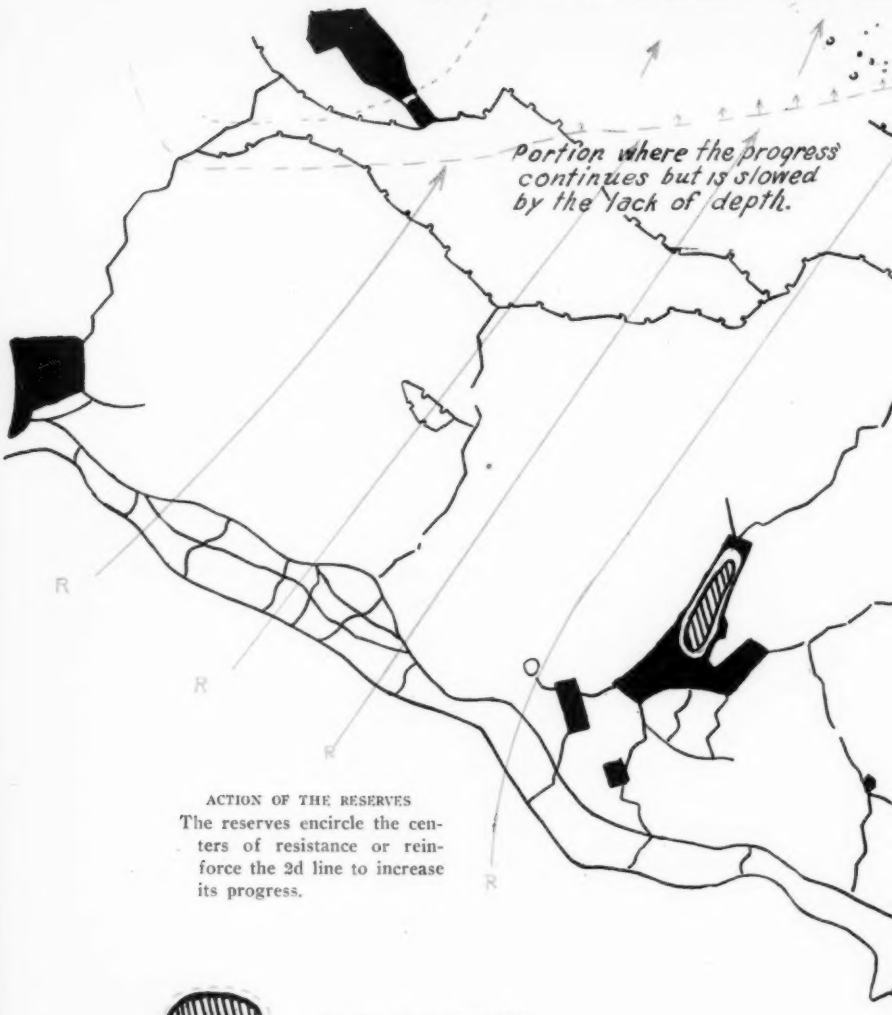
Pl. III.


Attack
Attack
Attack
Attack
Attack
Attack
Bn destined to fill the intervals caused by spreading out
R
R
Complete encircling of the village
Attack directed on the resistance.
Progression thru intervals between resistances
R
Bn destined to fill the interval caused by spreading out

SECOND LINE OF ATTACK.

Pl. IV.

ACTION OF RESERVE BATTALIONS. *Zone Definit*

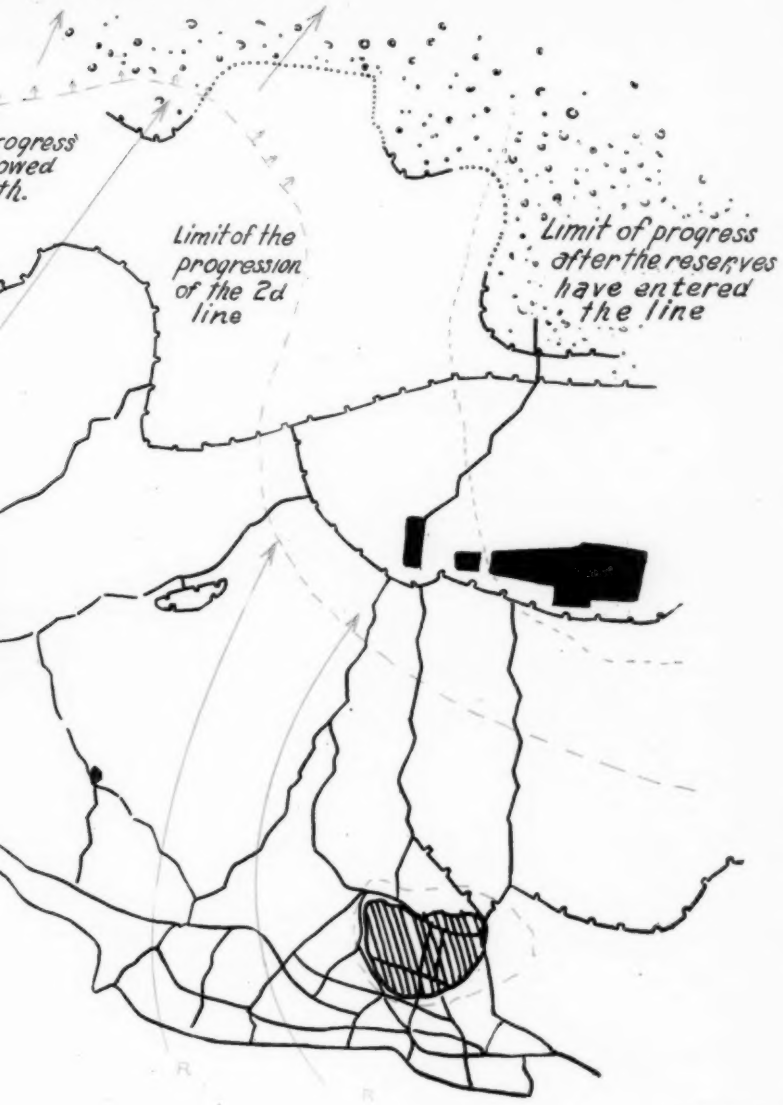


ACTION OF THE RESERVES

The reserves encircle the centers of resistance or reinforce the 2d line to increase its progress.

Hostile group encircled.

Zone Definitely Cleared.



Pl. V.

Method of Training Troops.[1]

By First Lieut. James L. Frink, 3d Infantry.

UNACCUSTOMED as we are to war, we are prone to lose sight of the relative importance of the requisites for its successful prosecution and conclusion. We read of great leaders; we study their masterful strategy and tactics; we picture new and terrible engines of destruction; we note the demand for undreamed quantities of ammunition and war matériel: but, do we realize fully the all-importance of man himself and the great and splendid rôle he plays?

Man is the prime requisite. Success depends upon his sacrifice and devotion. That this may not be made in vain, he must pass through a course of training and become in fact a soldier, an artisan schooled in the craft of war. This training must progress with the end in view of developing certain characteristics which distinguish the trained soldier: discipline; knowledge of methods; skill in the mechanism of methods and the performance of habitual duties; and physical fitness. The scheme of training must be scientific, orderly, and progressive.

Before proceeding with the discussion of the scheme of training and its adaptability to the varying conditions and peculiarities of our service, it is well to consider the basic principles of training which underlie the development of these characteristics and the general methods of their application. The element of time affects only the intensity and thoroughness of methods. A critical study of our own troop training and that of the great military powers leads to the following classification and grouping of the subject: (*a*) Fundamental Training; (*b*) Special Training; (*c*) Methods in general; (*d*) Scheme of Training.

FUNDAMENTAL TRAINING.

This training comprises the development of discipline; the attainment of technical, mechanical, and manual skill; the

[1]Awarded honorable mention in competition for Infantry Prize for best essay on subject "Method of Training Troops so as to Graduate Trained Men into the Army Reserve after Two Years' Service with the Colors."

acquirement of a thorough knowledge of military economics and routine; and tactical training.

Development of Discipline.

Discipline is the hallmark of the military character, the outward visible or mechanical expression of those military qualities which, as a result of training, enable the leader to uphold the law, preserve order, and exact obedience. It is developed through a mental and moral training which forms part of the soldiers' daily life and instruction. It has for its aim the establishment of the ideal military character, which possesses in the largest measure every desirable attribute of the human soul. The ideal soldier is a kindly, considerate man. He has respect for himself and a wholesome regard for others. He goes about his duties cheerfully, willingly, and with gladness in his heart. He respects the law; he is orderly and peacefully disposed; he is obedient to his superiors and exacts obedience from those set under him. He is a determined man, resolute and courageous; and in those hours that hang most heavily in man's life, those dark, fearful hours preceding the battle from which he may never return, he remains steadfast and faithful to the end. His spirit of devotion and self-sacrifice deserves only the highest praise from all mankind, whose servant and benefactor he has even been.

So in our work of developing discipline, we must get way down under the crust, down next to the very heart and soul of the men in training. They must feel from the first that their work is the most noble, the most self-sacrificing profession in the world; that as a consequence thereof, their own lives and characters must be without reproach. To accomplish this, our leaders and instructors must themselves be of the highest type, capable and devoted to their work. By their example, their teachings must be exemplified.

The basis of character development is self-respect. This is one of the very foundations of the soldier's daily life. With it comes respect and regard for others and for the law. Mutual respect breeds mutual confidence—a prerequisite for great deeds on the fields of combat and an essential for successful training.

During the very earliest training, the recruit must be made to feel an obligation or sense of duty which he is in honor bound to

render to his country. Many motives inspire men to duty—chief of which is honor. Hence the importance of treating the recruit as an honorable man and not as a derelict.

Hand in hand with duty and honor comes patriotism, or the love of country, with its powerful influence and stimulus. Have you ever talked to your men of their country's grandeur and the many things it stands for before the world? Have you never seen the tears well up in their eyes at the tales of great and valorous deeds performed, and the noble lives sacrificed in her service? Then indeed, you have been denied a wonderful privilege and overlooked a great lever for the uplift of good training.

In every phase of training, we must remember the great moral assets of cheerfulness and patience on the part of the instructor and leader and contentment on the part of the man. Their powerful influences extend not only through peace times in the barracks or camps but to the very battlefield itself. Their presence is essential to the bringing out of the best in the men. A grouchy, disagreeable, cursing drill-master begets a grouchy, half-hearted, sullen execution. Cheerfulness may be had without letting down the bars of discipline one inch. Patience, toleration of reasonable mistakes, and a quiet gentlemanly demeanor are at no time more important to the officer than during the intimate personal contact of training. In military matters, the recruit finds himself in an identical situation with the child who has just entered school. Patience and forbearance, as with the child, will bring out all the good, while the opposite qualities will break his heart or breed a sullen or perhaps criminal disposition. It is difficult at times to preserve even the semblance of these virtues, but they are absolutely necessary for the full attainment of the end in view. The most worthless recruit will seldom fail to evince some interest in his work if he feels that his officers take some personal interest in his instruction and welfare. Sometimes a kindly question or a moment of explanation will win his interest; patience and a due consideration of the man's pride and self-respect do more than indiscriminate "skins" and "crawlings."

No opportunity should be lost to impress upon the mind of the soldier the advantage of the offensive. He must become thoroughly imbued with the "spirit"—the will to hammer, hammer,

hammer, as long as a breath of life remains. Devotion and self-sacrifice are most necessary for the embodiment of this most desirable of attributes in combat. Here again the importance of the example of the officer or leader. Determination, resolution, courage—offspring alike of a sense of duty, honor, and fidelity—must be deep-rooted principles of the soldier's character, carefully fostered and developed during the instructional period, not not only by practice during field exercises and maneuvers, but throughout every phase and alongside all other training. Boldness, a contempt for danger, a confidence in his own power and the capabilities of his comrades, must become a part of the soldier's very self. Cooperation must be the rule throughout the service. Upon it collective and combined efficiency depend. The spirit of helpfulness should abide with us all. To build up rather than tear down should be the aim of every individual who wears the uniform. Success will be measured by the degree of this cooperation.

Having considered the desirable qualities in a very general way, we turn to those which are likely to undermine the results of our labors. It is a matter of more or less common knowledge that man, of all animals, is the most susceptible to fear. Fear creates panic. A reasoning fear is probably common to all men to a greater or lesser extent. This fear is increased by ignorance of what to expect or what may come. It can be combated in peace training to a considerable extent by talks to the men of the general subject of "man in war." These lectures should cover every phase of combat and the varied feelings of the individual, especially when *first* subjected to fire; they should explain in detail and by means of illustrations and diagrams the effect of rifle and gun fire, especially artillery fire, which seems so to demoralize infantry; they should have as their ultimate end to impress on the minds of the men that, be their fear what it may, safety lies only ahead and flight is suicide; that the enemy is experiencing the selfsame emotions and that a good hard knock in all probability will throw him into a panic. During combat, fear works continually to make one forget his sense of duty and obligations. There it must be overcome and allayed by the example of the leaders, and their firm, cool control of themselves and their organizations. Trained troops look to their leaders in emergency and when surprised. The secret of peace training is

to form the habit of looking to the leader. Men are imitators, and this quality is of value in direct proportion to the caliber of the leader.

The human element is the sustaining factor in combat. The quality of the factor is the quality of the element. The element naturally improves with the degree of the intelligence. As the plane of the intelligence rises, so will the general quality of the man improve. We must use every means to develop the soldiers' general intelligence. However, we must not be misled into believing that even the perfection of the individual's understanding and the absolute human maximum of intelligence will be positive insurance against collective stupidity. Under certain conditions and circumstances, troops seem to be gorged with all the psychological susceptibilities of the ordinary corner crowd, and allow themselves to be led astray by a mere suggestion of danger.

Disciplinary training is the most important work that falls to the lot of the officer. Its effects are farthest reaching and of the greatest consequence. It devolves upon every organization commander to solve this own particular problems. His methods will depend not only upon the class and previous condition of the men with whom he has to deal but upon his own temperament. He must have the support of his superiors in a full and adequate measure. Every member of the organization must be made the subject of critical character study in order that apparent defects may be remedied. Ignorance of the men under him and a careless, thoughtless enforcement of discipline do more harm than months of first-class training can eradicate. Obedience must be exacted to the last detail; but a close attention to the manner of its insistence will go a long way toward the establishment of true discipline. Wholeheartedness and devotion to duty on the part of the officer inspire a like spirit in the men. Officers must become true leaders. It is easy to drive with the force of authority to back one up. But can the best results be obtained by such methods? Should the regular soldier forever have hurled at him from the waysides, "You do it because you have to"?

Technical, Mechanical, and Manual Training.

This comprises instruction in the use of arms, matériel, and equipment, the mechanism of the different schools of

drill, and range practice, except field firing. The details of the methods to be employed, and those that should without fail be strictly observed, are set forth fully in the authorized text. In this respect, our service is abreast the times. This class of training must of necessity be uniform throughout each branch. Perfection and skill are distinguishing marks of the trained soldier. A higher efficiency is more necessary today than ever before in the history of man. Uniformity of execution is essential. Instruction must be detailed, thorough, and complete. Periods of instruction must be cut to the minimum and increased in frequency. Skill once acquired must not be allowed to deteriorate through long disuse. It is an established principle that short practice periods extending over many days contribute in the greatest degree to maximum efficiency. That training is best which stretches many subjects over a considerable period of time, rather than a few subjects over a very short time. If this has never been demonstrated to the reader's satisfaction, let him try the two schemes with two sets of average men and compare results.

This class of training admits of the full use of the well known methods of study, illustration, explanation, drill, and application. Much individual instruction must be given in order to insure satisfactory results. As the men become more proficient, they may be grouped for collective instruction. After the details have been mastered by all, frequent practice only will keep them up to the mark.

Military Economics and Routine.

This subdivision includes the care and preservation of arms and equipment; elementary hygiene; castrametation; transportation; development of physique and marching powers; and routine.

A soldier must have the most intimate knowledge of the methods of caring for his arms and equipment. Careful training and practice are necessary for continuing efficiency. As in all other training, this must begin with painstaking individual instruction and be supplemented by frequent inspections to insure against neglect. The manuals of the various departments contain full and complete directions for the care and preservation of arms and the different classes of equipment. For the best results, these directions should not be disregarded or displaced by other methods.

Personal hygiene is quite as important to the soldier as his arms and equipment. A man who is ignorant of the ways of caring for himself and providing for his health and comfort under the varying conditions of a soldier's life presents a sorry spectacle; he is proof positive of criminal neglect on the part of the officer responsible for his instruction, or else is one of that class of undesirables who are hopeless and beyond the pale. This knowledge and instruction may be imparted by many and various means. A series of questions and answers may be formulated, or one of the many published pamphlets may be used which cover the subject thoroughly. In the use of this method of familiarizing the men with the principles of hygiene, care must be taken that the answers are understood. This catechizing should be followed by illustration and the application of the principles or methods described, and may be supplemented by lectures, illustrated if possible, enlarging somewhat on the subject covered. The principles of hygiene must not be allowed to become mere sayisms but must be insisted upon during every moment of the soldier's service. Poor hygiene breeds poor health and consequent decrease in the physical powers, a predisposing cause of that fatigue which is a common forerunner of panic in war.

Castrametation includes the art of camping, shelter, and individual cooking, with their accompanying expedients for the health and comfort of the troops. The mechanical operations of tent pitching and other details may be learned with a little drill and practice, but the art is thoroughly learned only by considerable practice under varying conditions.

Transportation includes practice in loading and unloading wagons; entraining and detraining; and, for tropical, jungle, or mountain service, pack transportation.

Physical training includes setting-up exercises, club, bell, and rifle exercises, apparatus work, running, jumping, climbing, swimming, marching, foot-ball, basket-ball, baseball, and all other forms of indoor and outdoor sport that aid in the development of physique. It is needless to remark on the importance of this training in the formation of a soldier. Every advantage should be taken of conditions existing at the various posts for physical development. Whenever weather conditions permit, this work should be carried on outdoors. The present training manual is

the last word of qualified experts on the subject. If followed in principle and spirit, most satisfactory and excellent results will follow.

In battle, much depends upon the individual physical powers. Strong, sturdy men are the last to succumb to fatigue. They are better able to carry out the orders and instructions of their leaders. Battles often require the very limit of human endurance, both physical and mental. A man who enters the combat in fit physical condition has more than an even chance. Physical ill-being breeds low morale and mental depression.

Marching power is indirectly improved by all forms of wholesome physical development. However, its direct development through practice should not be neglected. For infantry, short marches with light equipment followed by longer marches with a constantly increasing load, should be made until the average daily distance is marched with the maximum load. By following this method, troops may be gotten into excellent marching condition within a very short time. Endurance tests have no value in training and should never be attempted.

Under Routine fall ceremonies and inspections, muster, interior guard duty, and the various customs of the service. These duties are valuable aids in the development of discipline. Indeed, it may be remarked that discipline is routine itself. This is no doubt correct, but discipline occupies such an important place in our curriculum that it deserves a separate and distinct classification. Routine duties are matters of interior administration and economy. The manner of their performance is usually a pretty good index of the efficiency of a command.

Tactical Training.

In the details of tactical training, infantry only will be considered. Basic principles are outlined as follows:

Leadership:
Teamwork; orders; communication;

Reconnaissance.

Fire Superiority:
Purpose and nature; direction and control; use of ground; choice of target; range; distribution of the target; observation; discipline; ammunition supply; artillery; fire of position.

Attack:

Deployment for attack; the advance; the fire attack; the charge; the pursuit; attack of fortifications; holding attack.

Defense:

Positions and intrenchments; deployment for defense; counter attack; delaying action.

Meeting engagements.

Withdrawal from action.

Protection of the march:

Advance guards; rear guards; flank guards; convoys.

Protection of the camp—establishing the outpost:

The reserve; the support; the outguards; patrols.

Miscellaneous:

Ammunition supply; night operations; infantry against cavalry; infantry against artillery; artillery supports; intrenchments; minor warfare; patrols, messages.

Instruction must begin with the individual. He must be taught to observe and to use cover properly. He must be practiced in range finding and bayonet combat. Principles should be explained and illustrated. Only after this has been done are the recruits fit for collective training on the terrain. Men cannot reasonably be expected to perform in an efficient manner that which they do not understand.

A great aid for beginners in this subject is a relief map, which is merely an elaboration of the sand table. This map should be built to a large scale. Rivers, lakes, ponds, etc., may be traced in blue paint; roads in red, black, or brown calcimine; orchards and forests by twigs or evergreens; houses and towns, etc., by blocks of wood cut to scale; stone hedges by pebbles; railroads by matchsticks strung together on wire or thread; bridges in miniature; cultivated or uncultivated fields by calcimine of various colors gently rubbed over the surface. Troops may be represented in miniature if the scale is large enough, otherwise by colored pins and cardboard. The relief map should be used in conjunction with a wall map representing the same area. The most unlooked-for results have been gotten from this miniature outdoors. The men obtain a quick grasp of the whole and are better able to understand the apparently small part the individual plays. Every

conceivable situation can be represented, and there is no end to the interest of the men. All arms may enter into the problem, as the director sees fit. After principles have been illustrated on this device, the men are usually ready for practical work of an elementary nature. The relief map is an ideal method of tactical indoor training and can be made use of during the winter months and during inclement weather at any time of year.

SPECIAL TRAINING.

Special training embraces:

(*a*) Training of individual specialists, such as scouts, topographers, agents of communication, demolition experts, horseshoers, farriers, blacksmiths, buglers, cooks, bakers, etc. A considerable amount of this training is provided in our service schools for enlisted men where the instruction is under the immediate supervision of experts. Where, however, the training is not so provided, it falls to the lot of the organization commander.

(*b*) Training of noncommissioned officers and selected privates, which is second only to that of the officer himself. They must become familiar with the technique of their own arm up to and including limits of their probable activities. Much of their training may be that of individual specialists, but as a rule, it is more general and consists chiefly of a study of fundamental subjects with a view of producing instructors. In the training of the noncommissioned officer, the officer has the advantage of being able to bring the full force of his own personality to bear. Relations of mutual confidence and understanding should at all times be encouraged. The noncommissioned officer must be made to feel his importance in the organization. His position must be made desirable. He should understand the policies of his organization commander. The methods of his instruction are in no wise different from those applied to the other men, except that the subjects are usually covered more fully and theories discussed.

METHODS IN GENERAL.

The general methods of instruction are study, illustration, explanation, drill, and application. These methods are so well known and universally used that an academic discussion of them seems out of place. Suffice it to say that particular and detailed

instructions as to the application of principles and methods of training should not be attempted. It should be sufficient to enunciate clearly the principles involved and the results expected, leaving to the zeal and inventiveness of the organization commander the particular method of their application. To do otherwise would deprive the officer of one of the great interests in his work.

It is necessary in the training of the individual that he should gain knowledge, not only for its own sake, but for the interest its acquirement will arouse. Principles known and understood, methods of procedure familiar to all, constitute the scientific theory of war which enhances the value of all training. The acquirement of knowledge sharpens the intellect, inspires self-confidence and self-reliance, increases resourcefulness and initiative, and makes reasonable to all what otherwise might appear to be tomfoolery. Drillmasters and instructors who take the time and trouble to inculcate in their men a thirst for knowledge, and then do all in their power to quench that thirst by painstaking teaching and explanation, will find a surprising increase in the mental capacity of their men and a consequent increase of individual and collective efficiency. The methods of the kindergarten, the grammar schools, and institutions of higher learning may be followed with profit and success, not only to the men, but to the instructor himself.

In most of our posts, we are forced to a considerable amount of indoor training. This is not the drawback that it might first appear. There are numerous aids to indoor training which give excellent results and are quite as necessary for complete development as outdoor work. Illustrated lectures, using any good projecting machine, add to the interest and permit the subject to be presented in a graphic and original manner. Some phase of nearly every subject will admit of treatment in this manner, particularly first aid, fire effect, influence of the ground, etc. For a study of minor tactics and combat principles, no better aid than the relief map is known. On this device, nearly every principle may be illustrated and explained in such a manner as to be readily and easily understood. It is, in fact, a miniature out-of-doors; miniature troops and targets supply the rest.

THE SCHEME OF TRAINING.

The evolution of a progressive, scientific, orderly, and systematic scheme of training is possible only after a careful consideration of the particular conditions existing, such as climate, organization, system of recruitment, class of men enlisted, work other than training required, and the time available. General principles of troop training do not vary. However, their application must be adjusted to conditions such as those enumerated. No single fixed scheme or program can be laid down, nor would it be desirable, even if practical. The scheme hereafter outlined is offered only as a suggestion and a guide. It is based on conditions such as usually prevail at a majority of our northern posts, the present organization, a like class of men to those now enlisted, and a two-year period with the colors. It is idle to weave fantastic theories around the idea of universal service; it is likewise almost criminal to add another suggestion to the great tangled mass of theories and ideas on reorganization. Only a revolutionary change in our military system would very much affect our training, and it is therefore most desirable to consider what is best to do with what we have. "Are we downhearted? No." We merely feel that it might possibly be worse.

Fundamental and special training should proceed at the same time. Men in the first year of service should receive instruction in fundamentals only, unless they attain a high state of proficiency and show some remarkable aptitude for some special work. No special training should be allowed to interfere with the fundamental training of the first-year man.

Within the regiment, major subjects for the periods should be prescribed, leaving all detail to battalion and company commanders. Results must be required, and frequent inspections and tests should be made by higher commanders to assure themselves that the work is up to the standard. Commanders who fail to get results reasonably expected should be replaced. A short course in the officers' schools on the general subject of training and the application of methods would do much to disseminate knowledge and provide for a general interchange of ideas that are by no means too universal.

Under the present system of recruitment, which will undoubtedly prevail for years to come, it is suggested that a considerable

improvement can be made by administrative means. There is no reason why regiments should receive recruits in driblets throughout the year, or even in two batches at different seasons of the year. The assignment of recruits may be regulated so that a particular regiment will receive all its recruits for the year within a certain short period, not exceeding thirty days. The assignment should be so arranged that, with the exception of non-commissioned officers, a regiment would find itself at the end of the first and succeeding years half one-year men, and the other half recruits just joined. Training could then proceed uniformly throughout the regiment, regardless of the time the training year for the regiment might have begun. Such an arrangement would admit of an excellent working out and division of fundamental and special training. There would be developed a rivalry for excellence of instruction of the different organizations and a basis on which to compare results.

The program for infantry is based on a training year beginning November 1. The year is divided into periods of Garrison Training and Field Training as at present. An infantry program only is here included.

The allotment of time during the year for instruction within the regiment and formations should be substantially as follows:

Company	10 months.
Battalion	1 month.
Regiment	2 weeks.
Brigade	1 week.
Division, in alternate years	1 week.
Field Army, in alternate years	1 week.

Garrison Training.

Garrison training should include the period from November 1 to April 31, inclusive. Allowing for guard and other duties that cannot be foreseen, a company should average fourteen drill days per month, including time allotted to higher units, in any post garrisoned by a battalion or more. Where more time is available, the instruction should be extended accordingly. Instructional days should be allotted during this period about as follows:

	Company.	*Battalion.*	*Regiment.*
November	14		
December	14		
January	14		
February	14		
March	8	4	2
April	8	4	2

On the basis of five hours' daily instruction during November, December, and April, and four hours daily during January, February, and March, the following course is laid out:

For first-year men:

Subject.	*Hours instruction in* Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1. Physical training	14	14	14	14	14	14
2. School of the soldier, squad, company	23	21	21	14	14	21
3. Care and preservation of arms and equipment, and packing authorized kits	14	7	4	4	4	4
4. Use of arms and recruit musketry training	14	14	4	4	4	4
5. First aid and elements of hygiene[2]		7	3	3	3	3
6. Bayonet exercises and combat			7	7	7	7
7. Combat principles, minor tactics				6	6	5
8. Marches, involving a tactical situation						4
9. Castrametation: tent pitching, etc. Loading wagons	3	2				4
10. Honors and salutes, military courtesy and customs	2	2				
11. Lectures, selected subjects		3	3	4	4	4
	70	70	56	56	56	70

[2]During November, this subject will be treated in talks after Saturday inspections.

For second-year men:

Subject.	*Hours instruction in* Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1. School of the company.....	7	7	7	3.5	3.5	7
2. Advanced physical training, including bayonet combat.....	14	14	14	14	14	14
3. Map making and map reading..	28					8
4. Signaling	14	14	14	14	14	14
5. Practical military field engineering			10	10	10	10
6. Machine-gun service	7	14	7	4	4	8
7. Minor tactics, combat principles: map maneuvers, tactical walks, etc.		21	4	6	6	5
8. Marches with first-year men...						4
9. Pack transportation				4.5	4.5	
	70	70	56	56	56	70

These two courses are so coordinated in respect to time that no little part of the training of the second-year men may be given along with the recruits or first-year men.

Field Training.

Field training should extend from May 1 to October 31. It includes target practice and is the period chiefly devoted to the application and practice of the principles learned during the period of garrison training. Every day not taken up with field exercises should have some time devoted to physical training. After setting aside one month for target practice, the remainder of the period should be allotted as follows:

	Actual days instruction.[3]
Company training	74
Battalion	13
Regiment	6
Brigade, etc.	12

The principles of combat may be illustrated and put into practice by a series of problems substantially as follows (taken from G. O. No. 31, 1st Infantry, 1914):

[3]Five instruction days per week except for brigade and higher training where seven days are considered.

For the company:

Company in attack, acting alone.
Company in attack, as an interior company of a battalion.
Company in attack, as a flank company of a battalion.
Company in attack, making enveloping attack.
Company in holding attack.
Company in delaying action.
Company in support, reinforcing firing line.
Company in support, meeting enveloping attack.
Company in support, meeting flank attack.
Company in support, meeting cavalry charge.
Company supporting outlined battery against outlined enemy.
Company in advance guard, as support and rear party.
Company in outpost, as support and outguards.
Company in withdrawal from action.
Night operations.

For the battalion:

Exercises with support in one or several bodies.
Battalion acting alone.
Battalion acting as interior battalion of regiment or brigade.
Battalion acting as flank battalion.
Battalion making holding attack.
Battalion acting as advance guard.
Battalion as advance guard meeting advancing enemy.
Battalion as advance guard encountering enemy on the defensive.
Battalion as rear guard.
Battalion withdrawing from action.
Battalion covering withdrawal of other troops from action.
Deployment with gaps.
Keeping touch across gaps.
Keeping touch with neighbors not visible.
Unexpected close encounters.
Attack on outlined artillery.
Advancing deployed from position two miles from the enemy.
Advancing over ground swept by artillery fire.
Action when charged by cavalry.
Selecting, taking up, intrenching and occupying positions.
Night operations.
Several of the above may be combined in one exercise.

Many other problems may be devised that illustrate principles. Every problem should be given with the view of illustrating some

particular principle. Many suggestions can be found in the infantry drill regulations and the many good works on tactics that are available.

The sole aim of this discussion has been to present the principles of training and to suggest the general methods of application in an understandable manner; to devise a practical scheme of instruction that will permit men to be transferred to the reserve as finished soldiers at the end of two years, at the same time keeping with the colors a wholesome leaven of trained men; to use to the greatest extent the actualities of the present rather than weave a fantastic theory about future possibilities.

Some Suggestions for Inspections.

By Major Eli A. Helmick, 28th Infantry.

GREAT advancement has been made in recent years in the field training of our troops and in the methods of inspecting or testing the degree of its efficiency. As valuable as this phase of military work is, I am of the opinion that in the enthusiasm of its pursuit, we have failed to follow up other things also important, if we have not actually or in comparison neglected them. Among these other things may be mentioned close-order drills, ceremonies, carefulness as to neatness and to details of uniform, and rendering the required courtesies. Discipline comes through these things, and surely no military man will be found to say that discipline is not important.

However, it is not intended to discuss the comparative importance of these subjects in this paper, but to call attention to a kindred subject, namely, the character and manner of making the inspections which are necessary in order that the organization commander may determine whether his command is properly equipped for the field. Inspections of this nature are matters of detail and require detailed knowledge on the part of the inspecting officer. As a class, our officers do not like detail. We rarely read an order more than once, and too often important bulletins and manuals are thrown aside with little more than a glance. This was forcibly brought to our attention in the Second Division when inspections were instituted to determine the condition of the equipment of the units composing the Division.

These inspections were the talk of the clubs and messes for days. "What difference did it make which man carried the shovel, the pick, or the wire cutters?" "What did it matter if the clip of ammunition in front of the ammunition pocket was not placed points up and the one in rear points down?" "Why should one bother his head about a little matter like seeing that the first-aid packet is placed in the pouch ring down and the bacon can in the pack lid up?" But the schedule of inspections continued to be carried out, and as the commanding officers did not wish to have their organizations criticised, everbody began digging up the orders, bulletins, and equipment manuals, or obtained the information

from those who had done so. Much to everyone's surprise, it was found that nothing was required that had not been prescribed by the War Department, and before the inspections were completed, grumbling gave way to approval and general satisfaction with having been shown how to make an effective inspection. It is the method followed in these inspections that is described in this paper.

The primary object of the inspections was to determine whether units were properly equipped for field duty; the secondary object was to instruct unit commanders in a systematic method of making an effective inspection of the equipment of their commands.

In this paper, it is assumed that the unit inspected is a regiment of infantry or one of its components, though it applies equally well to the units of any other arm of the service. Equipment A with two days' reserve rations and uniform F (less 3, 9, and 10 U. R., p. 62) are assumed to have been prescribed.

The regiment was formed in column of squads and marched to the place of inspection. Either before it arrived there or after it had arrived, the command was halted, and the inspector and his assistants passed down the column to determine whether the intrenching tools and the wire cutters, bolos, and hand-axes were carried, whether they were properly distributed in the column, and whether the packs were properly made up. This formation permits quick and accurate inspection for the purposes named.

The regiment was then formed for inspection, the dispositions being modified to suit the ground, with the headquarters and machine-gun companies at the rear and the supply company with the transportation, the latter being parked or in column near by. Beginning at the first battalion, an inspection was made to determine whether—

The first-aid packet was carried, the pouch properly attached to the belt, and the packet in the pouch as prescribed;

The proper amount of ammunition was carried and properly placed in the ammunition pockets;

The identification tags were worn and properly marked;

The oiler and thong cases contained oil and the thongs and other parts were complete;

The canteen cover, shovel carrier, wire-cutter carrier, meat-can pouch, and haversack were properly marked;

The rifles and bayonets were clean and free from rust;

The uniforms were in good condition and hat cords properly secured.

As soon as this part of the inspection of a company had been completed, directions were given to pitch shelter tents. After this had been done, the inspection proceeded as follows:

The shelter tents and mosquito bars were examined to see if they were serviceable and the tents properly pitched;

The contents of the rolls and the personal equipment of the men were examined and checked;

The remainder of the equipment was examined for marking;

Contents of the surplus kits were inspected and checked;

Shoes and socks were removed for inspection and the feet examined for corns, bunions, and abrasions;

Canteens were examined to see if they were filled and were free from leaks;

Condiment cans were opened and examined to see if they contained the required amount of the sugar, coffee, and salt components of the ration and if the men understood the use of the dividing rings marked thereon;

Bacon cans were inspected to see if the cans were serviceable;

Surplus-kit bags were examined, and cleaning rods, foot powder, and adhesive tape checked;

Stamping outfit, field desk, and cooking equipment examined and checked.

The headquarters and machine-gun companies were inspected in a similar manner. The horse equipment of the mounted men was carefully examined to determine whether it was complete, properly cared for and the saddles properly packed. Officers' mounts were inspected, and all public animals examined to determine whether they were properly shod and hoof-marked. The transportation was inspected to see that it was complete and serviceable, that the wagons were properly loaded, and that all spare parts were present and in their proper places. Officers' rolls were examined to ascertain whether they were complete and within the prescribed weight.

In making this inspection, the Commanding General was assisted by one or two officers of the Inspector General's Department, his two personal aides, a medical officer, and a veterinarian. Each of these officers was assigned a particular duty to perform, the assignment being made in conformity to his special qualifications.

The inspection consumed the greater part of one day, but when it was completed, the inspector had no uncertain knowledge of the state of equipment of the regiment.

This form of inspection is quite as applicable to the battalion and to the company as to the regiment. It has the virtue of being thorough, and unless an inspection is thorough, it is of little real value. As prescribed in the Infantry Drill Regulations and as fixed by long custom, our inspections have been more formal than effective. The ordinary Saturday inspection is generally a function of short duration. The inspecting officer passes from right to left in front of the ranks and from left to right in rear, and the inspection is complete as to arms, equipment, and clothing. There may be trained observers who can see everything at this one passage. I have tried it and have failed. One thing at a time is the better plan if a thorough inspection is what is desired. For example, in making a company inspection, the inspector may well pass down the company for each of the following operations: inspection of the rifles as prescribed in the Infantry Drill Regulations; reinspection of rifles with the floor plates removed to determine whether the floor-plate springs are clean, free from rust, and oiled; inspection of the oil and thong cases and examination to determine whether the spare parts are carried in the spare-part containers. In this operation, the brush, thong, and weight should be assembled and held vertically beside the barrel of the rifle so as to make apparent whether the thong is serviceable and of proper length. If the dropper is inserted in the oil can and withdrawn, the drop appending to the point of the dropper will show whether the can contains oil without the necessity of tipping it. The flaps of the ammunition pockets should be unbuttoned and tucked back inside the belt so that the inspector may see whether the belt contains the proper amount of ammunition and whether it is properly placed in the pocket. If shelter tents are to be pitched, this part of the inspection may be deferred until that phase of the inspection is reached. The inspector should determine whether the first-aid pouches and canteen covers are properly attached to the belts and the packets properly placed in the pouches and whether the identification tags are worn and correctly marked. The number and disposition of intrenching tools can best be determined while the company is in column of squads. The condition of the equipment, the correctness of the make-up of the packs and the examination

of the compasses, field glasses, range finder, steel tapes, and signal kits can be made while passing back in front or in rear of the ranks in performing these different operations. If the shoes are not to be removed for the purpose of inspecting the feet, the soles of the shoes worn may be inspected by having the men raise first one foot and then the other to the rear, exposing the soles of the shoes; the men can steady themselves by placing the left hands on the shoulders of the men to their left.

This part of the inspection being completed, shelter-tent camp may be made. The tents may be inspected while the men are arranging the contents of the rolls, haversacks, and surplus kits. A satisfactory way of inspecting the mosquito bars is to have them stretched over the tents after the tents have been inspected. The Infantry Drill Regulations give an excellent arrangement of the rolls and packs for inspection in shelter-tent camp. Care should be taken, however, to see that the blankets and ponchoes are so folded that the marking is exposed. The contents of the surplus kits may well be displayed immediately in front of the men to whom they belong, care being taken to preserve uniformity in arrangement of articles throughout the company.

This part of the inspection may involve the following operations: inspection and checking up of the ordnance property and examination to determine whether it is properly marked; inspection and checking of the toilet articles and clothing carried in the haversacks and rolls; inspection and checking of the contents of the surplus kits; examination of the canteens by having them held tops down to determine whether they contain water and do not leak; check to determine whether the rations ordered are carried and properly disposed; removal of shoes and examination of the feet, shoes, and stockings; examination of the surplus-kit bags, the stamping outfit, the field desk, and field cooking equipment.

The company commander may well utilize a part of the time to determine whether the men of the company are well instructed in assembling the full equipment with and without rations and the full equipment less the pack, with and without rations, as described in the "Instruction for Assembling the Infantry Equipment, model of 1910."

It will be seen that an inspection of this kind is no small task and will occupy the company commander and his assistants the greater part of a morning or at least two hours. Each officer

present should be assigned a portion of the inspection, and if there are no officers, noncommissioned officers should assist.

The inspection of the rifles of a regiment or a battalion is a fatiguing task if it is performed as prescribed in the Infantry Drill Regulations. This may be avoided by having the bolt removed and an assistant pass in front of the rank and place a small mirror, such as is used by dentists, in the chamber of the rifle while the inspector passes in rear and examines the bore. The mirror reflects the light through the bore, making dirt or defects quickly visible. The rifles remain on the shoulders of the men during this operation, the muzzle being lowered to suit the inspector. The bolt is held in the left hand by the soldier until after it is examined by the inspector, who, passing in rear, inspects the rifles from right to left, and then passes in front of the men from left to right inspecting the bolts. The mirror, although a valuable aid, is not necessary, as the inspection can be made in the same manner without the mirror or the use of an assistant.

In inspecting the transportation, the small articles forming a portion of the quota of spare parts, such as bolts, rivets, open links, etc., may be displayed on the ground near the wagon, being laid out on a feed sack or a piece of canvas. Drivers should be required to learn all the spare parts and their uses and should be caused to display the parts in a uniform manner throughout the detachment or wagon company. Nothing assists the inspector so much as order and system in the display of property to be inspected.

The above suggestions are made with the hope that they may prove helpful to the organization commander in his endeavor to keep informed as to the state of the equipment of his organization. They have been developed through long experience in making inspections. It is not claimed nor believed that they are the best that can be devised, but it is hoped that they may stimulate a desire to improve the present method of making inspections of equipment by organization commanders. We breathe a sigh of relief when the inspector ends his visit to our commands. If the colonel knows the state of equipment of his regiment, the major of his battalion, and the captain of his company, none of these officers will have any reason to fear the result of inspections made by, or pursuant to orders of, superior commanders.

The following lists of questions were prepared by the Commanding General, Fifth Brigade, to be used by organization com-

manders in making inspections of their organizations to determine the completeness and serviceability of the equipment pertaining to them for field service (Questions for an inspection of equipment "A" and surplus kits preseuted in equipment "B"):

FOR A BATTALION OR COMPANY.

1. How many officers at inspection?
2. (*a*) Did each officer have full equipment prescribed?
   (*b*) State shortages.
3. How many enlisted men at inspection?
4. What was the military appearance of enlisted men as regards:
   (*a*) Clothing worn;
   (*b*) Set-up;
   (*c*) Fit and packing of equipment;
   (*d*) Neatness.
5. At inspection, how many men had corns or needed treatment for their feet?
6. What was the general appearance and condition of feet at inspection?
7. (*a*) Were any cases of "dhobie" or other itch found on feet?
   (*b*) How many?
8. Are all men receiving treatment for bad feet when needed?
9. (*a*) Were all stockings worn at inspection in good condition?
   (*b*) How many were in bad order?
10. How many men did not wear woolen stockings? If any, state by whom authority to wear other than woolen was given and necessity for same.
11. Were all shoes worn at inspection "broken in" and in serviceable condition?
12. Was all clothing serviceable and only that prescribed?
13. Was ammunition in belts the amount prescribed, and was it carried properly in every pocket?
14. Were there any defective pockets in the ammunition belts?
15. Were canteens full and in good condition?
16. Were cups in good condition?
17. Were any canteen covers unserviceable?
18. Were all first-aid packets in serviceable conditions and carried as prescribed?
19. (*a*) Were all first-aid pouches serviceable?
   (*b*) How many unserviceable?
20. How many rifles at the inspection?
21. Was every rifle clean and in serviceable condition?
22. Did every rifle have brush and thong; also oil as prescribed?
23. (*a*) Were the two telescopic sights and the two rifles in each company fitted for these sights carried?
   (*b*) If not, why not?
24. Were the bayonets and scabbards clean and in good condition?
25. Was the entire equipment uniformly carried?

26. Were the haversacks uniformly and properly packed, and were all straps for carrying them serviceable in every way?
27. Were all articles prescribed for haversacks carried and were they in good serviceable condition?
28. Were the contents of condiment cans as prescribed for number of days' rations ordered?
29. Was the bacon can carried top up?
30. Was anything carried in meat cans to prevent rattling of knife, fork, and spoon, and were the pocket for meat can, the can itself, and its contents all complete and in good condition?
31. Was the pack properly and uniformly packed?
32. (*a*) Were all prescribed articles carried in the pack?
(*b*) Were they all in good condition and serviceable?
33. Were intrenching tools complete in each squad and carried as prescribed?
34. Did every man have a properly marked identification tag with his name, company, rank, etc.?
35. Was all equipment properly marked as prescribed with company, regiment, and number? (All articles are not required to be marked exactly alike, but each kind of article should be marked in the same place and manner. Articles should be marked only as prescribed for the article itself.)
36 Did first sergeants and musicians have pistols and were the pistols clean and serviceable, and prescribed ammunition carried properly?
37. Did each first sergeant carry a watch compass, a pair of field glasses *EE*, a Weldon range-finder and pouch, a 5-foot tape and a 60-foot tape, a field message book, a note book, a pencil, and a whistle?
38. Did each sergeant carry a watch compass, a field message book, a pencil and a whistle? Two sergeants in each company should also each carry a field glass *EE*.
39. Did each company musician carry a bugle, a bugle sling, a field glass (*A* or *B*), a flag kit (infantry, combination), a wire cutter and carrier, a field message book, a pencil, and a whistle?
40. Did each squad leader carry a screw driver (rifle) two .04 inch and two .06 inch drift slides, a roll of adhesive tape, a box of foot powder, a housewife, a field message book or note book, and a pencil?
41. Did number 4, rear rank, carry jointed cleaning rod and case, or were surplus kits carried?

Surplus Kits.

42. Did each man inspected have a surplus kit complete as prescribed?

43. (*a*) Was each pair of shoes in surplus kit "broken in" and serviceable?
    (*b*) How many were found unserviceable?
44. (*a*) Was every pair of woolen stockings in surplus kits inspected?
    (*b*) How many were found unserviceable?
45. (*a*) Was every suit of underclothing in surplus kits inspected?
    (*b*) How many were found unserviceable?
46. (*a*) Was every shirt in surplus kits inspected?
    (*b*) How many were found unserviceable?
47. (*a*) Was every pair of breeches in surplus kits inspected?
    (*b*) How many were found unserviceable?
48. (*a*) Was every extra pair of shoe laces in surplus kits inspected?
    (*b*) How many were found unserviceable?
49. Did each company have all the articles given below? If not, state what articles were short.

	No.	
Quartermaster:		
Axes and helves	2	
Bags, water, sterilizing	1	
Bars, mosquito, single	33	
Bedding rolls	1	for each officer
Buckets, p. i.	2	
Candles (if no mineral oil carried)	..	
Cooking utensils, march kit	1,	(G. O. 39. 8, and 22, 1915)
Desk, field, small, and contents	1	(G.O.39 and 8, 1915.)
Headnets, mosquito	7	
Lanterns, combination, complete	2	
Matches, boxes	24	
Oil, mineral, gals	3	
Oil, neatsfoot, pints	2	
Pickaxes and helves	2	
Powder, hypo. of lime, tubes	50	
Shovels, s. h	2	
Soap, issue, lbs	12	
Stretcher, shoe	1	
Tents, shelter, complete	3	
Tents, fly, wall	1	
Barber kit	1	(G.O. 39–15.)
Litters	1	
Rations:		
Field, days, per man	2	
Reserve, days, per man	1	
Ordnance:		
Stencil, personal equipment	1	
Cartridges, ball, cal. 30, rifle, per rifle	120	
Cartridges, ball, cal. 45, pistol, per pistol	21	
Range-finder (B and L.)	1	

50. Did each battalion headquarters have all the articles given below? If not, state what articles were short.

	No.
Quartermaster:	
Axes and helves	8
Bedding rolls	2
Buckets, g. i	1
Candles (if no mineral oil)	..
Colors	1
Desk, field, small, and contents	1
Handcuffs, pairs	1
Lanterns, combination, complete	1
Matches, boxes	6
Menders, harness	1
Nails, horseshoe, lbs	2
Oil, mineral, gals	2
Pickaxes and helves	8
Salt, rock, lbs	1
Shoes, extra, horse, lbs	2
Shoes, mule, fitted, lbs	16
Shoes, mule, extra, lbs	4
Shovels, s. h	8
Sling, color, o. d	1
Tent, pyramidal, small, complete	1
Ordnance:	
Packs, small-arms ammunition	2
Repair material, combat, chest or box (Arm repair chest.)	1
Medical:	
Box reserve dressings	1
Litters	3
Engineer:	
Reconnaissance outfit	1
Grain:	
Reserve (each wagon)	36 lbs.
Rations:	
Reserve (each wagon)	2
Field, days, per man on ration section	2
Reserve, days, per man on ration section	1

51. How many rifles are equipped with spare-part containers? (All rifles manufactured since October 1910 will hold either the spare part container or the oil and thong case. With commands equipped with these rifles, the odd numbered man should carry oil and thong case and the even numbered the spare part container.)

HEADQUARTERS COMPANY.

1. Did every man in the three sections of this company have an identification tag marked properly with his name, rank, etc.?

2. What was the military appearance of enlisted men in the three sections as regards:
   (*a*) Clothing worn;
   (*b*) Set-up;
   (*c*) Fit and packing of equipment;
   (*d*) Neatness.

Noncommissioned Officers Section (*less the animals*).

3. How many enlisted men of this section at inspection?
4. Has each enlisted man the complete equipment prescribed? If not, state shortages.
5. Is their clothing, including that in surplus kits, as prescribed and in good condition?
6. Were the prescribed arms and ammunition carried as ordered?
7. What is the condition of their arms?

Mounted Orderly Section (*with all animals belonging to company*).

8. How many enlisted men of this section at inspection?
9. Has each mounted orderly the complete equipment prescribed? If not, state shortages.
10. Is their clothing, including that in surplus kits, as prescribed and in good condition?
11. Were the prescribed arms and amounts of ammunition carried as ordered?
12. What is the condition of their arms?
13. Are all the mounted orderlies good horsemen? If not, which are not and in what are they deficient?
14. Is every animal properly branded?
15. Is every animal properly hoof-marked?
16. Is every animal properly shod?
17. Are animals watered and fed three times a day as required?
18. Have any animals thrush or scratches? If so, how many?
19. Is every animal serviceable and suitable for work required? If not, answer in full.
20. Are any animals injured or sick? If so, state number, the nature of injury, or cause of sickness.
21. Are the animals properly groomed and taken care of? If not, how many?
22. Are the saddles and bridles in good condition?
23. Have bridles been properly fitted?
24. Are all the animals in good condition?
25. Are there any shortages in the number of animals?
26. Any grey animals?
27. How many enlisted men of this section at inspection?
28. Has each enlisted man the complete equipment prescribed? If not, state shortages.
29. Is their clothing, including that in surplus kits, as prescribed and in good condition?
30. Are the prescribed arms on hand?

31. What is the condition of their arms?
32. (*a*) Is the proper amount of ammunition on hand? (*b*) Is it carried as prescribed?
33. Has each musician his proper band instrument?
34. Were all the band instruments in good condition?
35. At the inspection how many men had corns, or needed treatment for their feet?
36. Were any cases of "dhobie" or other itch found on feet? If so, state how many.
37. Are all men receiving treatment for bad feet when needed?
38. Were all stockings worn at inspection in good condition? If not, how many were in bad order?
39. How many did not wear woolen stockings? If any, state by whom authority to wear other than woolen was given and necessity for same.
40. Were all shoes worn at inspection "broken in" and in serviceable condition?
41. Was all clothing serviceable and only that prescribed?
42. Are the descriptive lists of public animals complete in all particulars, especially as regards hoof marks?
43. Are the descriptive lists for all private mounts used with the regiment prepared and ready in case of a move?
44. Are there any animals with sore backs? If so, how many?

MACHINE-GUN COMPANY.

1. How many officers at inspection?
2. How many enlisted men at inspection?
3. Are there any shortages in the personnel of the Machine-Gun Company? If so, what?
4. Has each man the complete equipment prescribed? If short what articles missing?
5. What was the military appearance of enlisted men as regards:
   (*a*) Clothing worn;
   (*b*) Set-up;
   (*c*) Fit and packing of equipment;
   (*d*) Neatness.
6. At inspection, how many men had corns or needed treatment for their feet?
7. What was the general appearance and condition of feet at inspection?
8. Were any cases of "dhobie" or other itch found on feet at inspection? How many?
9. Are all men receiving treatment for bad feet when needed?
10. (*a*) Were all stockings worn at inspection and in surplus kits in good condition? (*b*) How many were in bad order?
11. How many men did not wear woolen stockings? If any, state by whom authority to wear other than woolen was given and necessity for same.

12. Were all shoes worn at inspection and in surplus kits in serviceable condition?
13. Was all clothing worn at inspection and in surplus kits in serviceable condition?
14. Are the prescribed arms on hand?
15. What is the condition of the arms?
16. Are the enlisted men properly instructed in packing the animals?
17. Is the proper amount of ammunition on hand?
18. Is every animal properly branded?
19. Is every animal properly hoof-marked?
20. Is every animal properly shod?
21. Are animals watered and fed three times a day as required?
22. Have animals thrush or scratches? If so, how many?
23. Is every animal serviceable and suitable for work required? If not, answer in full.
24. Are any animals injured or sick? If so, state number, nature of injury, and cause of sickness.
25. Are the animals properly groomed and taken care of? If not how many not so?
26. Have the bridles been properly fitted?
27. Do all the aparejos fit the animals?
28. Are the aparejos in good condition and properly set up?
29. Are there any shortages in the number of animals?
30. Any grey animals?
31. (*a*) Are the machine guns complete in all parts? (*b*) Are the telescopic sights, guns and all parts in good condition?
32. Are all spare parts prescribed for machine guns carried?
33. Is the ammunition prescribed for each gun carried properly?
34. Are the identification tags prescribed marked properly with name, company, rank, etc.?
35. Are there any animals with sore backs? If so, how many?

SUPPLY COMPANY.

1. How many officers at inspection?
2. How many enlisted men at inspection?
3. Are there any shortages in the personnel of the train? If so, state shortages.
4. Are all the teamsters competent drivers, and do they know how to handle and care for their animals?
5. Have the quartermaster teamsters and the other employees the complete equipment prescribed? If not, state shortages.
6. Is their clothing serviceable; all that is prescribed, and in good condition?
7. (*a*) Are the prescribed arms on hand? (*b*) Where carried?
8. What is the condition of the arms?
9. Is the proper amount of ammunition on hand and is it carried as prescribed?

10. Are the identification tags prescribed marked properly with name, company, rank, etc.?
11. Is every animal properly branded?
12. Is every animal properly hoof-marked?
13. Is every animal properly shod?
14. Are animals watered and fed three times a day as required?
15. Have any animals thrush or scratches? If so, how many?
16. Is every animal serviceable and suitable for work required. If not, answer in full.
17. Are any animals injured or sick? If so, state number, the nature of injury, and cause of sickness.
18. Are the animals properly groomed and taken care of? If not, how many not so?
19. Are the animals properly hitched up in all cases? If not, what were the faults observed?
20. Have the bridles been properly fitted?
21. Do all the collars fit?
22. Does the breeching fit in all cases?
23. Is the harness in good condition? If not, how many sets are not so?
24. Are all the riding animals pertaining to the train in good condition and their equipment in good order?
25. Are there any shortages in the number of animals either riding or draft?
26. Any grey animals?
27. Are the wagons in first-class condition? If not, in what particulars are they lacking?
28. Are all wagons numbered and marked as prescribed?
29. Are all the spare parts numbered with the number of the wagon?
30. Are all the prescribed parts carried?
31. Were belts, buckles, rings, snaps, etc., for wagons and ambulances checked up and counted to see that they agree with list in General Orders, No. 39, War Dept., 1915?
32. Are the descriptive lists of public animals complete in all particulars, especially as regards hoof marks?

LIST OF AUTHORITIES PRESCRIBING ARTICLES OF EQUIPMENT AND THEIR DISPOSITIONS.

Distribution of intrenching tools—I.U.A. E. M. p. 46, (1), (*m*) and (*n*).

Making of packs—Instructions for Assembling the Infantry Equipment—Ordnance Pamphlet No. 1717, pp. 7–10.

Formation for Inspection—I. D. R., par. 745.

First-aid pouch, where carried—par. 74, Uniform Regulations.

First-aid packet, how placed in pouch—par. V, G.O. 44, W.D., 1913.

Ammunition, amount to be carried—I. U. A. E. M. p. 46, (*k*).

Ammunition, manner of placing in pockets—Instructions for Assembling the Infantry Equipment, Ord. Pamphlet No. 1717, par. 1 (*c*).

Identification tag—par. 79, Uniform Regulations.
Manner of pitching shelter tents—par. 792, I. D. R.
Marking of equipment—Ordnance Pamphlet No. 1718.
Oiler and thong cases and spare-part containers—note 1, p. 33, I. U. A. E. M., and pp. 25-26, Ordnance Pamphlet No. 1923, of 1915.
Equipment of escort wagons—G.O. 39, W.D., 1915, pp. 569–570.
Equipment of ambulances—G.O. 39, W.D., 1915, pp. 572–574.
Stockings, wearing of, for marching—par. IV, G.O. 30, W.D., 1913.
Cooking utensils, march kit—G.O. 39, W.D., 1915, p. 10, and 4th Ind., A.G.O., June 10, 1915.
Company barber kit—G.O.39, W.D., 1915, p. 556.
Field desk—G.O. 39, W. D., 1915, p. 565.
Mender, harness—G.O. 39, W. D., 1915, p. 560.
Reconnaissance outfit—I.U.A.E.M., p. 8, and par. II, G.O. 7, W. D., 1916.
Repair Materials, combat—G.O. 26, W.D., 1914.
Reserve dressings—par. 884, Manual for the Medical Department.
Magazine pocket, web, double; attaching to belt—par. I, Bul. 40, W.D., 1915.
Loading wagons—G.O. 8, W.D., 1915 and Tables of Organization, Section I.
Surplus kits—G. O. 56, W.D., 1915.

A Brief Military Contemplation.[1]

By Lieut.-Colonel Freiherr v. Welck, German Army.

CONCERNING the aims of war, it is not permissible to write for the time being, and moreover quite properly, although it would certainly be of value to learn the views and wishes of the different quarters and those of the different political parties. But the old rule of not dividing the hide until the bear is killed still holds good and also applies in the present case. It may be assumed, however, that the differences of opinion do not differ so widely. The whole German people are in any case unanimously determined that the conclusion of peace following a war of victory must furnish a guarantee for a lasting peace and provide the means for our unqualified independence in political, military, commercial, and industrial respects—on land and water—for all time. The question as to how this guarantee can best be accomplished will naturally be answered differently. On this point, the different political standpoints principally come into consideration. All of these questions can naturally be answered only after the war is ended and its results have been definitely determined. Then only, when weapons are at rest, can the activity and effectiveness of diplomats and statesmen begin. That we can look forward to this work with the same confidence previously placed in our army leaders and incomparable troops is not only our hope but also our firm assurance. For this reason also, we consider it proper that all discussions regarding the aims of the war should be abandoned.

In addition to these war aims and war consequences which will involve the political formation of the greatest part of the earth and the mutual relations of the peoples now in strife, the war will also exercise considerable influence upon the inner political conditions of the countries concerned, our German Fatherland included. We think the prominent problems will be questions of constitution and organization. Among the latter, the question of military organization in its various demarcations will naturally play a great rôle, if not the greatest, as we are indebted for the new formation above all to our military success. The world war, which has at

[1] Translated from *Jahrbücher für die deutsche Armee und Marine*, March, 1916.

this writing lasted for nineteen months, has in many respects brought entirely new developments accompanied by new lessons respecting means for conduct of war, respecting armament, use of weapons, employment of troops, and increase of capacity, and in general, respecting strategy and tactics, so that it will require patient work to obtain a clear conception of the new conditions.

It would far exceed our knowledge and the space at our disposal even if we should only touch superficially upon the most important innovations created by the war—innovations which even the wildest imagination could not have thought out a few years ago—but we will cast a hasty glance at the entire picture of our army as it appears to us for the last nineteen months in its entire difference from former teachings and experience, and base our comments upon the very discreet war reports received.

If one makes a comparison between our armies which stand today far in the enemy's country in the west, east, and south, and our armies which fought in France 45 years ago, in respect to organization, leadership, armament, fighting methods, etc., one could believe himself transferred not merely to another century but to another age. The old participants from the middle of the last century often lack not alone a correct understanding but also the correct scale for judgment. When the war broke out in August, 1914, it first appeared that it would develop along familiar lines: army corps were combined into armies and large masses of cavalry were before the front, who were counted upon to come into collision with the hostile cavalry, which had the same problems assigned to it on the part of our enemy on the east and west. These cavalry combats were to be followed by large decisive field battles and an advance into the enemy's country. In 1870, the war against France began in this way. Neither the layman nor the expert who did not have the opportunity of following all changes in teachings of war during the last 40 years had any real reason to expect such a complete change and a new state of affairs. Furthermore, we believe that thinking and well-informed experts were greatly surprised at the first development of the war. That the mode of fighting of the infantry, and indeed in a large measure, that of artillery and cavalry also, must necessarily be other than that 45 years ago, was taken for granted, for this was plainly evidenced in the Russo-Japanese and Balkan Wars; but that after a few weeks, the entire field war would develop into position warfare and that after nineteen months, no decisive battle in the west,

and in the east indeed an overwhelming defeat of the enemy but still not his complete overthrow, these were not to be seen in advance.

None of the armies which were in contact with one another from the beginning were unprepared for the new methods of fighting. The infantry especially had for many years been trained along lines required by present-day tactics, and the employment of infantry, dictated by the conditions, offered no surprises either for our army or the French and English armies—so far as concerns formations and manner of attacking. Especially new, on the contrary, was the extensive employment of infantry as pioneers. Although the spade was already an important auxiliary weapon for all arms of the service, yet the difficulty in carrying out larger and more thorough exercises—difficulties occasioned by short term of service, many-sidedness of training requirements, and especially by terrain conditions, and not least, financial considerations—all stood more or less in the way. Hand-in-hand with the extension of spade work went mine warfare formerly practiced only by pioneers, and now a fighting method for all arms.

Fighting with hand-grenades, mine throwers, etc., was, however, quite new. Also in respect to employment of machine guns and heavy artillery, important changes have taken place. The most potent innovation is found in the flyer and airship formations; already employed in the Balkan Wars for information and reconnaissance purposes, they have now become powerful fighting weapons. Formations such as mountain artillery and ski troops, which we had not tried out in the German Army, now perform a conspicuous rôle.

What effect these experiences of the present position warfare will have upon later training and employment of troops, the future alone can tell. But certain fundamental indications can, however, already be determined. Among these, we count upon a general cooperation of all arms of the service with a more or less sacrifice of their distinguishing characteristics. Field fortifications, which have reached an extension heretofore unknown, will not be constructed by pioneers alone but also by infantry and cavalry, not to mention the fortification troops formed for this special purpose. *The service of guns, telegraph, and telephone, as well as of all kinds of observation posts, will devolve upon all arms of the service.* The exceptionally large demand for officers needed for the constant augmentations and new army units is generally not sufficiently

covered by the officer supply of the respective arm. The infantry especially requires details from the other arms, especially from the cavalry. Accordingly we find a great number of officers of other arms doing duty in the field as well as with depot troops, filling their positions acceptably. This is glorious evidence of ability, consciousness of duty and true comradeship!

While our enemies, especially the English and Russians, are suffering on account of lack of officers who are capable of training, leading and exerting influence upon troops, we have found in our reserve officers a material which has far exceeded our expectations and hopes. Reserve officers representing all classes and vocations of life are doing service at the front or in other responsible places, not only as combatants and workers, but also as trainers and shining examples. There is scarcely any difference now between active and reserve officers, even the lines of separation due to political and religious differences have disappeared with the progress of the national war, so that now there exists the *German officer* only. The physician, lawyer, professor, teacher, artist, and mechanic—all command their sections or companies, all offer their blood and lives with equal enthusiasm and self-denial for the beloved Fatherland and for the welfare of their subordinates and comrades, and the ability to perform increases in proportion to the demand which must be met. One need only see how many lieutenants command companies or batteries, how many captains command battalions, etc. But this is not all! It touches one's heart when it is considered how many old officers long since obligated to no duties who have enthusiastically volunteered their services in order not to be merely in position behind the front, but in the foremost line, willingly sacrificing health, blood and life for the Fatherland. We must here mention another category of our old comrades, who have most unselfishly served the Fatherland, and met demands required of them in every respect. These are the old non-commissioned officers, who as substitute-officers and sergeant-lieutenants responded to the first call of their Emperor and upon whom now devolves the larger part of the very important work of training reserves. One sees comparatively very few officers with our reserve troops, positions being filled for the larger part, by old noncommissioned officers, and we have heard of none who did not cheerfully give up civilian occupation, wife and children in order to become useful to the Fatherland and Army.

New Methods of Machine-Gun Fire.[1]

By Captain Friedrich v. Merkatz, German Army.

PART II. FIRE EFFECT.

A. FIRE EFFECT UNDER NORMAL CONDITIONS.

CHAPTER 5. DIMENSIONS OF THE MACHINE-GUN SHEAF.

THE table in this chapter gives a résumé of dimensions of the beaten zone without deep fire, also with 50, 100, 200, and 300 meters deep fire. The calculations are the results of extensive firings by the gun-proving board. The figures, like all other tables, only represent averages.

The figures in the columns "No deep fire" and "50 meters deep fire" are not interchangeable with Figures 1 and 2, and 4, 5 and 6, respectively.[2] The figures given in the table are the averages of a great number of firings without observation in which the average was based on about 1,000 shots for each firing.

It will be surprising how extraordinarily great are the depths of the 100 per cent sheaf at short ranges, as shown in the columns

TABLE—THE 100 PER CENT AND USEFUL DEPTHS OF THE BEATEN ZONES IN METERS.

Distance in meters	No deep fire		50 m. deep fire		100 m. deep fire		200 m. deep fire		300 m. deep fier	
	100 per cent sheaf	Useful part	100 per cent sheaf	Useful part	100 per cent sheaf	Useful part	100 per cent sheaf	Useful part	100 per cent sheaf	Useful part
800	250	80	350	140	460	190	570	240	750	300
900	220	75	290	120	385	170	480	230	670	300
1000	200	70	250	110	330	150	420	220	600	300
1100	185	70	220	100	290	140	375	210	530	300
1200	170	65	200	90	260	130	340	200	480	300
1300	155	65	190	85	240	120	310	200	440	300
1400	145	60	180	85	225	110	280	200	410	300
1500	140	60	180	85	215	105	260	200	380	300
1600	140	60	175	85	210	100	250	200	350	300

[1]Translated for the INFANTRY JOURNAL from *Das neue Maschinengewehr Schiess-Verfahren.* Continued from the July-August, 1916, number.

[2]See pages 2, 4, 10 and 11, July-August, 1916, number of the INFANTRY JOURNAL.

for 200 and 300 meters deep fire. This is caused by the offshoots in the extremities of the sheaf, which actually occur with the coarse method of 300 meters deep fire and the additional errors of the gun pointers as a result of the flatness of the trajectory. These are not merely calculated values, but were obtained by actual firing.

CHAPTER 6. TABLES OF FIRE EFFECT.[3]

Figure[4] 8 show the even distribution of the hits on a target when the gun pointer executes deep fire correctly. By reason of this even distribution, it is possible to calculate the percentage of direct hits to be expected within the useful part, against targets of any size, with any interval.

Needless to say, ricochets cannot be calculated; but I must discuss in more detail firing without and with only 50 meters deep fire.

In firing without, or with only 50 meters deep fire, an attempt is made to hold the sheaf of Figures 4, 5, and 6 constantly on the target in accordance with the corrections of the gun commander.[5] An exact calculation of the percentage of hits to be expected in this case is impossible. The figures under these two headings are therefore based on the average dimensions of the sheaf from the table on page 175.

While, therefore, the tables showing 100, 200, or 300 meters deep fire actually give the approximate percentage of direct hits expected in round numbers, it is possible to exceed the given values materially with only 50 meters or without any deep fire, as the sheaf may be narrowed through the corrections of the gun commander. If the percentages shown here are not obtained, it can be seen from the table that better results could possibly have been obtained if so many corrections had not been made. From the depths of the useful sheaves at the target as shown in the table, it may be seen that in firing without any deep fire (without corrections during firing), the useful part, *e.g.*, at 1,000 meters, is 70 meters deep. If we succeed in bringing the target within this space, the percentages shown will be obtained, though it must be considered that with such small useful spaces the percentages given are only averages. At the edges, the result

[3] See pages 178 and 179.
[4] See July-August, 1916, number of INFANTRY JOURNAL, page 16.
[5] See July-August, 1916, number of INFANTRY JOURNAL, pages 10 and 11.

will be smaller, and in the center alone will it be greater than shown here. These are, however, such small differences in range that in firing without deep fire, the result is always a matter of chance.

The more deep fire is used, the flatter is the area[6] of hits of the useful space, *i. e.*, the useful space is not so sharply separated from the outer parts of the sheaf, the transition is more gradual, and 20 or even 50 meters difference in range at the target matters little or not at all, while in firing without deep fire, even 10 meters make an enormous difference in the percentages of direct hits expected.

If the result to be expected is exceeded, the useful space has been diminished.

If the result to be expected is not attained, the useful space has been enlarged. Should the corresponding deep fire have, nevertheless, been used, it was incorrectly delivered, or the gun commander did not succeed in bringing the useful space into the target. He would probably have done better in the latter case had he used more deep fire.

The percentages shown below give only averages. The result obtained will, however, always approximate the figures in the table though it should again be emphasized that the more deep fire is used the more closely will the figures agree.

The Tables of Fire Effect are naturally of no value for use in war, as it would be impossible to calculate whether the firing will or will not obtain commensurate results. But in peace, commander and troops can be tested with the tables as to whether or not they know how to use their machine guns correctly.

It seems almost impossible to construct, in peace, targets representing service conditions. Where will lines of heads 300 meters long offer themselves in war? and for from 3 to 5 minutes? These were fallacies! But it is, nevertheless, advisable to fire against such targets in peace if the error is not committed of setting up the targets so that they are plainly visible. On the contrary, but few points of the enemy's lines should be discernible, exactly as the targets show themselves in war. Here and there an incautious head shows itself, or a careless soldier betrays,

[6] *I.e.*, in the graphical representation as shown in the right-hand column of Figures 7 and 8, pages 14 and 16, July-August number of the INFANTRY JOURNAL.—Editor.

I. Head Targets.

Distance in m.	No deep fire									50 m. deep fire								
	Depth of useful part at target in m.	Clear interval in m.								Depth of useful part at target in m.	Clear interval in m.							
		0.5	0.8	1.0	1.5	2.0	2.5	3.0			0.5	0.8	1.0	1.5	2.0	2.5	3.0	
800	80	4.8	3.7	3.2	2.4	1.9	1.6	1.4		140	2.7	2.1	1.8	1.4	1.1	0.9	0.8	
900	75	4.0	3.0	2.6	2.0	1.6	1.3	1.1		120	2.5	1.9	1.6	1.3	1.0	0.8	0.7	
1000	70	3.3	2.5	2.2	1.6	1.3	1.1	0.9		110	2.2	1.7	1.5	1.1	0.9	0.7	0.6	
1100	70	2.7	2.0	1.7	1.3	1.0	0.9	0.8		100	2.0	1.5	1.3	1.0	0.8	0.7	0.6	
1200	65	2.2	1.7	1.4	1.1	0.8	0.7	0.7		90	1.8	1.3	1.1	0.9	0.7	0.6	0.5	
1300	65	1.8	1.4	1.1	0.9	0.7	0.6	0.5		85	1.6	1.2	1.0	0.8	0.6	0.5	...	
1400	60	1.5	1.1	0.9	0.8	0.6	0.5	...		85	1.4	1.0	0.9	0.7	0.5	...	...	
1500	60	1.2	0.9	0.8	0.6	0.5	...	...		85	1.2	0.9	0.8	0.6	0.5	...	...	
1600	60	1.0	0.7	0.6	0.5	...	...	...		85	1.0	0.7	0.6	0.5	...	...	...	

Distance in m.	100 m. deep fire									200 m. deep fire								
	Depth of useful part at target in m.	Clear interval in m.								Depth of useful part at target in m.	Clear interval in m.							
		0.5	0.8	1.0	1.5	2.0	2.5	3.0			0.5	0.8	1.0	1.5	2.0	2.5	3.0	
800	190	1.8	1.4	1.1	0.9	0.7	0.6	0.5		240	1.6	1.2	1.0	0.8	0.6	0.5	...	
900	170	1.6	1.2	1.0	0.8	0.6	0.5	...		230	1.4	1.0	0.9	0.7	0.5	...	...	
1000	150	1.5	1.1	0.9	0.8	0.6	0.5	...		220	1.2	0.9	0.8	0.6	0.5	...	...	
1100	140	1.3	1.0	0.8	0.7	0.5	...	...		210	1.0	0.8	0.7	0.5	...	...	...	
1200	130	1.2	0.9	0.8	0.6	0.5	...	...		200	0.8	0.6	0.6	0.5	...	...	...	
1300	120	1.0	0.8	0.7	0.5	...	...	...		200	0.7	0.5	0.5	...	...	...	...	
1400	110	0.9	0.7	0.6	...	...	...	...		200	0.6	0.5	...	...	...	...	...	
1500	105	0.7	0.6	0.5	...	...	...	...		200	0.5	...	...	...	...	...	...	
1600	100	0.6	0.5	...	...	...	...	...		200	...	...	...	...	...	...	...	

II. Breast Target (Prone Silhouettes).

Distance in m.	No deep fire									50 m. deep fire								
	Depth of useful part at target in m.	Clear interval in m.								Depth of useful part at target in m.	Clear interval in m.							
		0.5	0.8	1.0	1.5	2.0	2.5	3.0			0.5	0.8	1.0	1.5	2.0	2.5	3.0	
800	80	8.8	6.6	5.7	4.3	3.4	2.9	2.4		140	5.1	3.8	3.3	2.5	2.0	1.6	1.4	
900	75	7.2	5.4	4.7	3.5	2.8	2.3	2.0		120	4.5	3.4	2.9	2.2	1.8	1.4	1.3	
1000	70	5.9	4.4	3.8	2.9	2.3	1.9	1.6		110	4.0	3.0	2.6	2.0	1.6	1.3	1.1	
1100	70	4.8	3.6	3.1	2.3	1.9	1.6	1.3		100	3.6	2.7	2.3	1.7	1.4	1.1	1.0	
1200	65	3.9	2.9	2.5	1.9	1.5	1.3	1.1		90	3.2	2.4	2.0	1.5	1.2	1.0	0.9	
1300	65	3.3	2.4	2.1	1.6	1.2	1.1	0.9		85	2.8	2.1	1.8	1.3	1.0	0.9	0.8	
1400	60	2.7	2.0	1.7	1.3	1.0	0.9	0.8		85	2.4	1.8	1.6	1.1	0.9	0.8	0.7	
1500	60	2.2	1.7	1.4	1.1	0.8	0.7	0.6		85	2.1	1.6	1.4	1.0	0.8	0.7	0.6	
1600	60	1.7	1.4	1.1	0.9	0.7	0.6	0.5		85	1.7	1.4	1.2	0.9	0.7	0.6	0.5	

Distance in m.	100 m. deep fire									200 m. deep fire								
	Depth of useful part at target in m.	Clear interval in m.								Depth of useful part at target in m.	Clear interval in m.							
		0.5	0.8	1.0	1.5	2.0	2.5	3.0			0.5	0.8	1.0	1.5	2.0	2.5	3.0	
800	190	3.3	2.4	2.1	1.6	1.2	1.1	0.9		240	2.7	2.0	1.7	1.3	1.0	0.9	0.7	
900	170	3.0	2.2	1.9	1.4	1.1	1.0	0.8		230	2.4	1.8	1.5	1.1	0.9	0.8	0.6	
1000	150	2.7	2.0	1.7	1.3	1.0	0.9	0.8		220	2.1	1.6	1.4	1.0	0.8	0.7	0.6	
1100	140	2.4	1.8	1.5	1.1	0.9	0.8	0.7		210	1.8	1.4	1.2	0.9	0.7	0.6	0.5	
1200	130	2.2	1.6	1.3	1.0	0.8	0.7	0.6		200	1.5	1.2	1.0	0.8	0.6	0.5	...	
1300	120	1.9	1.4	1.2	0.9	0.7	0.6	0.5		200	1.3	1.0	0.8	0.6	0.5	...	...	
1400	110	1.6	1.2	1.1	0.8	0.6	0.5	0.5		200	1.1	0.8	0.7	0.5	...	...	...	
1500	105	1.4	1.0	0.9	0.6	0.5	...	...		200	0.9	0.6	0.5	...	...	...	...	
1600	100	1.1	0.8	0.7	0.5	...	...	...		200	0.7	0.5	...	...	...	...	...	

III. Kneeling Targets (Kneeling Silhouettes).

Distance in m.	50 m. deep fire									100 m. deep fire								
	Depth of useful part at target in m.	Clear interval in m.								Depth of useful part at target in m.	Clear interval in m.							
		0.5	0.8	1.0	1.5	2.0	2.5	3.0			0.5	0.8	1.0	1.5	2.0	2.5	3.0	
800	140	8.4	6.4	5.6	4.2	3.4	2.8	2.4		190	5.4	4.2	3.6	2.7	2.2	1.8	1.5	
900	120	7.5	5.8	5.0	3.8	3.0	2.5	2.1		170	4.9	3.8	3.3	2.4	2.0	1.6	1.4	
1000	110	6.7	5.1	4.5	3.4	2.7	2.2	1.9		150	4.5	3.4	3.0	2.2	1.8	1.5	1.3	
1100	100	5.9	4.5	4.0	3.0	2.4	2.0	1.7		140	4.0	3.1	2.7	2.0	1.6	1.4	1.2	
1200	90	5.2	4.0	3.5	2.6	2.1	1.8	1.5		130	3.6	2.8	2.4	1.8	1.4	1.2	1.1	
1300	85	4.6	3.5	3.1	2.3	1.8	1.6	1.3		120	3.1	2.4	2.1	1.6	1.2	1.1	0.9	
1400	85	4.0	3.1	2.7	2.0	1.6	1.4	1.2		110	2.7	2.1	1.8	1.4	1.1	0.9	0.8	
1500	85	3.4	2.7	2.3	1.7	1.4	1.2	1.0		105	2.2	1.7	1.5	1.2	0.9	0.8	0.6	
1600	85	2.9	2.3	1.9	1.4	1.2	1.0	0.8		100	1.8	1.4	1.2	0.9	0.8	0.6	0.5	

Distance in m.	200 m. deep fire									300 m. deep fire								
	Depth of useful part at target in m.	Clear interval in m.								Depth of useful part at target in m.	Clear interval in m.							
		0.5	0.8	1.0	1.5	2.0	2.5	3.0			0.5	0.8	1.0	1.5	2.0	2.5	3.0	
800	240	4.5	3.5	3.0	2.3	1.8	1.5	1.3		300	3.0	2.3	2.0	1.5	1.2	1.0	0.8	
900	230	3.9	3.0	2.7	2.0	1.6	1.3	1.1		300	2.5	2.0	1.7	1.3	1.0	0.9	0.7	
1000	200	3.4	2.6	2.4	1.7	1.4	1.1	1.0		300	2.2	1.7	1.5	1.2	0.9	0.8	0.6	
1100	210	2.9	2.3	1.9	1.4	1.2	1.0	0.8		300	1.9	1.5	1.3	1.0	0.8	0.7	0.6	
1200	200	2.5	1.9	1.6	1.2	1.0	0.8	0.7		300	1.6	1.3	1.1	0.8	0.7	0.6	0.5	
1300	200	2.1	1.6	1.4	1.1	0.9	0.7	0.6		300	1.4	1.1	1.0	0.7	0.6	0.5	...	
1400	200	1.7	1.3	1.2	0.9	0.7	0.6	0.5		300	1.2	0.9	0.8	0.6	0.5	...	...	
1500	200	1.4	1.1	1.0	0.7	0.6	0.5	...		300	1.0	0.8	0.7	0.5	...	...	...	
1600	200	1.1	0.9	0.8	0.6	0.5	...	...		300	0.8	0.6	0.5	...	...	...	...	

IV. Figure Targets (Standing Silhouettes).

Distance in m.	50 m. deep fire									100 m. deep fire								
	Depth of useful part at target in m.	Clear interval in m.								Depth of useful part at target in m.	Clear interval in m.							
		0.5	0.8	1.0	1.5	2.0	2.5	3.0			0.5	0.8	1.0	1.5	2.0	2.5	3.0	
800	140	13.9	10.7	9.2	6.9	5.5	4.6	4.0		190	8.9	6.9	5.9	4.4	3.6	3.0	2.5	
900	120	12.4	9.6	8.3	6.2	4.9	4.2	3.6		170	8.1	6.3	5.4	4.0	3.2	2.7	2.3	
1000	110	11.1	8.5	7.4	5.5	4.4	3.7	3.2		150	7.4	5.7	4.9	3.7	2.9	2.4	2.1	
1100	100	9.9	7.6	6.6	4.9	3.9	3.3	2.8		140	6.6	5.1	4.4	3.3	2.6	2.2	1.9	
1200	90	8.7	6.7	5.8	4.3	3.5	2.9	2.5		130	5.9	4.5	3.9	2.9	2.3	1.9	1.7	
1300	85	7.6	5.9	5.1	3.8	3.1	2.5	2.2		120	5 1	3 9	3 4	2 5	2 0	1 7	1 5	
1400	85	6.6	5.1	4.4	3.3	2.7	2.2	1.9		110	4.4	3.4	2.9	2.2	1.7	1.5	1.3	
1500	85	5.7	4.4	3.8	2.8	2.3	1.9	1.6		105	3.8	2.9	2.5	1.9	1.5	1.3	1.1	
1600	85	4.8	3.7	3.2	2.4	1.9	1.6	1.4		100	3.3	2.5	2.2	1.6	1.3	1.1	0.9	

Distance in m.	200 m. deep fire									300 m. deep fire								
	Depth of useful part at target in m.	Clear interval in m.								Depth of useful part at target in m.	Clear interval in m.							
		0.5	0.8	1.0	1.5	2.0	2.5	3.0			0.5	0.8	1.0	1.5	2.0	2.5	3.0	
800	240	7.5	5.8	5.0	3.7	3.0	2.5	2.1		300	4.9	3.8	3.3	2.5	2.0	1.7	1.5	
900	230	6.5	5.0	4.3	3.2	2.6	2.2	1.8		300	4.3	3.3	2.9	2.2	1.7	1.5	1.3	
1000	220	5.6	4.3	3.7	2.8	2.2	1.9	1.6		300	3.8	2.9	2.5	1.9	1.5	1.3	1.1	
1100	210	4.8	3.7	3.2	2.4	1.9	1.6	1.4		330	3.3	2.5	2.1	1.6	1.3	1.1	0.9	
1200	200	4.1	3.1	2.7	2.0	1.6	1.4	1.2		300	2.8	2.2	1.8	1.3	1.1	1.0	0.8	
1300	200	3.4	2.6	2.3	1.7	1.4	1.2	1.0		300	2.4	1.8	1.5	1.1	1.0	0.8	0.7	
1400	200	2.9	2.2	1.9	1.4	1.2	1.0	0.8		300	2.0	1.5	1.3	1.0	0.8	0.7	0.6	
1500	200	2.4	1.8	1.5	1.1	1.0	0.8	0.7		300	1.7	1.3	1.1	0.8	0.7	0.6	0.5	
1600	200	1.9	1.4	1.2	0.9	0.8	0.6	0.5		300	1.4	1.1	0.9	0.7	0.6	0.5	...	

through a movement, the location of the enemy's lines—nothing more should be seen. Nevertheless, the enemy's position is densely and almost uniformly occupied, and his fire forces the leader to counter action and therefore to fire against invisible targets, against sections of terrain.

Right here the full value of firing with the graduated scale becomes apparent: the leader is enabled to cover the enemy's position systematically with fire. The skill of the leader and his subordinates shows here to great advantage, as without it, failure will be the only result. But so much the better; leaders of this kind should not be entrusted with machine guns in war.

How can targets be set up to simulate service conditions?

It is not absolutely necessary to place a silhouette at every spot where an enemy skirmisher would lie; it is sufficient if every target can be hit considering the angle of fall.

Should the section of terrain be correctly searched with the machine guns, the target will receive the same percentage of hits 10 meters in front or in rear.

It is of utmost importance to fire against such targets in peace; of course, there are other targets, but they do not pertain to this chapter which discusses only systematic deep fire.

The Tables of Fire Effect give an actual illustration of what the machine gun is capable in similar cases under service conditions, and if we assume the minimum requirement as 0.5 per cent direct hits, it is easy to calculate whether or not in any given case effective results can be obtained. The Tables of Fire Effect also indicate how much ammunition must be expended to obtain sufficient effect at the target.

These are not problems for deliberation during the firing, but they are preparations for firing which the director must work out at home.

Example:

The company commander intends firing against nearly invisible head targets at 1 meter interval, with 200 meters deep fire at 1,100 meters. He wishes to find out if it will pay to use such deep fire, and also how much ammunition he must expend in this case to obtain a satisfactory result.

Table I, Head Targets, shows:

With 200 meters deep fire, range 1,100 meters and 1 meter interval = 0.7 per cent direct hits.

Should the company commander consider about 35 or 40 direct hits a satisfactory result, the amount of the ammunition required would be 5,000 to 6,000 rounds, since—

$$\frac{0.7 \times 5000}{100} = 35 \text{ and } \frac{0.7 \times 6000}{100} = 42 \text{ direct hits.}$$

Adding thereto the ricochets, the company commander will obtain a satisfactory result with 5,000 rounds.

The result will be obtained in about 3 minutes, with absolute certainty.

CHAPTER 7. CRITIQUE OF THE RESULTS OF MACHINE-GUN FIRE.

Critique of results depends upon the conditions of observation under which the firing was held. The visibility of the target also plays an important part, as is evident from the preceding chapter. A machine-gun company which obtains many hits under favorable observation, is by no means better trained than the one which obtains fewer hits under poor observation. To give a just critique, the amount of deep fire each machine gun used must be recorded during the firing. The results which a well trained company should obtain can then be quickly calculated with the aid of the Tables of Fire Effect. As a machine gun will only in exceptional cases retain the deep fire ordered at the beginning during the entire firing, but will in most cases narrow the sheaf, an impartial observer with each machine gun must note about how many shots were fired with each kind of deep fire.

When this data has been assembled, the calculated results compared with the hits obtained (direct hits) show whether the company fired well or poorly.[7]

Care must be taken not to be deceived by reports of a deeper fire than was really used. The officer in charge can easily determine this by observing the turning of the handwheel from time to time.

It is the director's duty to decide whether the amount of deep fire used was correct, or if more or less deep fire would have been proper.

[7]See examples on pages 182 and 183.

CRITIQUE OF THE RESULTS OF THE MACHINE GUN FIRE.

EXAMPLE 1

Target 1. Head Targets at 1000 m. Interval 0.8 m.

1. M. G.		2. M. G.		3. M. G.		4. M. G.		5. M. G.		6. M. G.		
Number of shots	Deep fire	Number of shots	Deep fire	Number of shots	Deep fire	Number of shots	Deep fire	Number of shots	Deep fire	Number of shots	Deep fire	
200 500 100	50 m. 100 m. 200 m.	500 100	50 m. None	300 500	None 50 m.	100 500	50 m. 100 m.	100 600	50 m. 200 m.	700 300	200 m. 100 m.	
100 shots with 200 m. deep fire = (1 × 0.9) = 0.9 direct hits												700 shots with 200 m. deep fire = (7.0 × 9) = 6.3 direct hits.
												300 shots with 100 m. deep fire = (3 × 1.1) = 3.3 direct hits.
												100 shots with 50 m. deep fire = (1 × 1.7) = 1.7 direct hits.
												600 shots with 200 m. deep fire = (6.0 × 9) = 5.4 direct hits.
												100 shots with 50 m. deep fire = (1 × 1.7) = 1.7 direct hits.
												500 shots with 100 m. deep fire = (5 × 1.1) = 5.5 direct hits.
												300 shots, no deep fire = (3 × 2.5) = 7.5 direct hits.
												500 shots with 50 m. deep fire = (5 × 1.7) = 8.5 direct hits.
												500 shots with 50 m. deep fire = (5 × 1.7) = 8.5 direct hits.
												100 shots, no deep fire = (1 × 2.5) = 2.5 direct hits.
												200 shots with 50 m. deep fire = (2 × 1.7) = 3.4 direct hits. 500 shots with 100 m. deep fire = (5 × 1.1) = 5.5 direct hits.
												Total, 60.7 direct hits.

The company should have obtained about sixty direct hits.

The company should have obtained about sixty direct hits.

EXAMPLE 2

Target 2. The same at 1300 m. (kneeling targets) with 2 m. interval

1. M. G.		2. M. G.		3. M. G.		4. M. G.		5. M. G.		6. M. G.	
Number of shots	Deep fire	Number of shots	Deep fire	Number of shots	Deep fire	Number of shots	Deep fire	Number of shots	Deep fire	Number of shots	Deep fire
200	300 m.	250	300 m.	Jams		100 200	300 m. 200 m.	250	300 m.	200 100	300 m. 100 m.
1.2 direct hits.		1.5 direct hits.				1.8 direct hits.	0.6 direct hits.	1.5 direct hits.		1.2 direct hits.	1.2 direct hits.
9.0 total direct hits.											

The company should have obtained 9 direct hits.

B. FIRE EFFECT UNDER SPECIAL SERVICE CONDITIONS.

CHAPTER 8. ERRORS IN RANGE FINDING.

(Using the Hahn Range Finder and Range Finder No. 14.)

Should the distance to a target be measured with a well-adjusted Hahn range finder, the measurement may differ from the correct distance about as follows:

Up to 1000 m., 2-3% of the distance;
Up to 1500 m., 3-3½% of the distance;
Up to 2000 m., 3½-5½% of the distance;

The range finder 14 is much more accurate.

Should, *e.g.*, the correct distance to the target be 1000 meters, the measurement may be between 970 and 1030 meters. Inversely, the target may lie between 970 and 1030 m. when 1000 m. was measured.

These errors in range finding would be of little consequence if for every distance there were a corresponding sight setting. The sight, however, permits only 50 meters change; for the intermediate distances there is but one sight setting available, *e.g.*, the 950 meters sight setting is used for all firing between 900 and 950 meters, and also between 920 and 970 meters. As these distances are first determined with the range finder and are therefore not exact, the errors in range finding become of more importance in this connection, as the following example will show:

A machine gun measured 920 meters as the range to a line of head targets, and fired with sight at 950. The range-finder reading was 3% over the correct distance, which was 893 meters.

A second machine gun, 107 meters in rear, measured 970 meters to the same target, and also sights at 950 meters. The range-finder reading was 3% short, the correct distance being 1000 meters.

Both guns determined the distance with a comparatively small error, which may occur even with new range finders. However, should both guns succeed in bringing the useful part of the sheaf in the target, *i.e.*, with sights at 950 meters to deliver effective fire at 893 as well as at 1000 meters, the sheaf must have a depth of at least 107 meters. The table on page 175 shows, however, that the beaten zone at 950 meters is only about 70 meters deep, the remainder would, therefore, have to be supplemented with deep fire.

In the hands of troops, the range finders will often show greater errors, and consequently greater differences between distance to target and sight setting will occur, on account of which the extent of the supplementary deep fire must also be greater.

It is assumed here that the range measurer does not make any error at all. But even an experienced range measurer obtains materially different results when making several measurements to one and the same target, and the differences become greater with increase of the distance to the target and decrease in its visibility. Even the best range finder cannot eliminate errors in measuring distances, and errors are the rule.

The new range finder 14 is an excellent optical instrument, but from the foregoing it is seen that errors are also made with it, and the deep fire should not be too rapidly narrowed.

Leaving out of consideration the accuracy of range-finding, weather conditions (Chapter 10, p. 186) also influence the range of the bullet materially.

CHAPTER 9. ERRORS IN ESTIMATING DISTANCE.

The determination of the distance by estimation is much less accurate than with the range finder. Long years of experiment have demonstrated that in general the better half of all estimates at one object lie in a space extending 10% of the distance in front or in rear of the target.

In estimating, *e.g.*, to a target 1200 meters distant, the better half of the estimates will lie between 1080 (= 1200 — 120) and 1320 (= 1200 + 120). The remaining estimates will be distributed over a space four or five times as large, and therefore in the above-mentioned case may lie between 600 and 1800 meters.

Reversing the case and selecting a definite sight setting corresponding to the estimate, the target will be often at a materially different distance. Even when only considering the better half of all estimates in an example, the unreliability of the procedure becomes very apparent.

A machine gun fires at a target with sight set at 950 meters based on an estimate of 920 meters. Even should this be the estimate of the better half, the correct distance could be about 840 meters (to 1020).

A second machine gun, in rear, also fires at the target with

sight at 950 meters based on an estimate of 970 meters. The correct range could be about (880 to) 1080 meters.

In sum, with estimates of 920 and 970 meters, both resulting in a sight setting of 950 m., the distance could be between 840 and 1080 m.

To secure fire effect with certainty, the first machine gun would, therefore, be compelled to cover the zone from 840 to 1020, the second the zone from 880 to 1080—both with 950 meters sight setting.

As there is no actual certainty that the estimates were those of the better half, the errors may be considerably greater.

Observation in war has substantiated this fully, as enormous errors have been observed by the author, who had the excellent range finder No. 14 at his disposal, and was, therefore, enabled to check the sight settings of adjacent organizations. To their great discomfiture, I was able at one time, for example, to prove that a target at 1850 meters was fired at with sight at 950 meters; another time a target 2000 meters distant with 1200 meters sight; a third time with the fixed sight at a target at 700 meters!

Could we ourselves have made a better estimate? I doubt it, and he who asserts that he would never make such errors should check himself with range finder 14—after he has estimated—and this in battle, under fire, when he must decide on the range quickly.

It is the universal desire that every platoon commander be provided with an instrument for measuring distance which will protect him at least from excessively great errors; it is to be hoped that our optical industry will soon succeed in giving us such an instrument, handy and light.

CHAPTER 10. INFLUENCES OF WEATHER.

In its flight from the muzzle to the target, the bullet is subject, in addition to the natural law of gravity, to the varying atmospheric influences. The resistance the bullet encounters in its flight is mainly dependent on the following:

(*a*) Weight of the air (*Luftgewicht*[8]).

(*b*) Motion of the air.

[8]The correct technical equivalent for the word here used in the German text is "density of the air." The literal translation "weight of the air" is here employed, as otherwise the explanation which follows would be meaningless.—Editor.

(*a*) *Weight of the Air.*

To assist the officer who is not familiar with such details, various points will be more fully explained in the following, which to the expert seem self-evident. The expression "weight of the air" does not mean the air pressure, as read from a barometer, but denotes the density of the air—the mass the bullet must penetrate in its flight. When it is said that the density of the air is 1225, it is meant that 1 cubic meter of air weighs 1225 grams.

TABLE A.

Weight of a cubic meter of air in grams with 50 per cent humidity and various barometer and thermometer readings:

Temperature in degrees C.	With a barometer reading of							
	710	720	730	740	750	760	770	780
+30	1080	1095	1110	1126	1141	1156	1172	1187
+25	1100	1115	1131	1147	1162	1177	1193	1209
+20	1121	1137	1152	1168	1184	1200	1216	1232
+15	1142	1158	1174	1190	1207	1223	1239	1255
+10	1163	1179	1196	1212	1229	1245	1261	1278
+ 5	1185	1202	1219	1235	1242	1268	1285	1302
± 0	1207	1224	1241	1258	1275	1292	1309	1326
− 5	1231	1247	1265	1282	1299	1317	1334	1351
−10	1254	1271	1289	1307	1324	1342	1360	1378
−15	1278	1296	1315	1333	1351	1369	1387	1405
−20	1304	1322	1341	1359	1377	1396	1414	1432

The greater the weight of the air, the denser it is, and the denser is the mass the bullet has to penetrate, and low shooting is the result. The lighter the weight, the thinner is the air, and the bullet has less resistance to overcome, and high shooting results.

The density of the air is dependent on:

1. The air pressure, indicated by the barometer reading. The higher the barometer reading, the more compressed is the air, and denser it is.

2. The temperature, indicated by the thermometer reading. The higher the temperature, the more expanded and thinner is the air. Here it is to be noted that with the same air pressure, different temperatures may obtain and vice versa, and that for this reason both these influences may enhance or neutralize each other.

3. The humidity of the air, which is so small as to be immaterial in practice.

TABLE B.

In the following table the preceding table is converted into a form suitable for practical use; the data are of course only approximate:

At about 1000 m. distance, the sheaf is displaced in meters:

Temperature in degrees C.	With a barometer reading of							
	710	720	730	740	750	760	770	780
	m	m	m	m	m	m	m	m
+30°	+70	+60	+55	+50	+40	+35	+30	+20
+25°	+60	+50	+45	+40	+30	+25	+15	+10
+20°	+50	+40	+35	+30	+20	+10	+ 5	± 0
+15°	+40	+30	+25	+20	+10	± 0	− 5	−15
+10°	+30	+20	+15	+ 5	± 0	−10	−20	−25
+ 5°	+20	+10	+ 5	−10	−10	−20	−30	−40
± 0°	+10	± 0	−10	−20	−25	−30	−40	−50
− 5°	± 0	−10	−20	−30	−35	−45	−55	−60
−10°	−15	−20	−30	−40	−50	−60	−70	−75
−15°	−25	−35	−45	−55	−65	−70	−80	−90
−20°	−40	−50	−60	−65	−75	−85	−95	−100

HIGH

LOW

At a range to the target of about 1500 meters, the sheaf is displaced about twice these amounts.

Our sights are regulated on an air density of 1225 grams. It follows that with an air density of 1225 the bullet strikes where aimed. An air density of 1225 grams, however, is not dependent on either the temperature or the air pressure alone, but the line running diagonally through the table shows when conditions are

such that the bullet strikes where aimed, *e.g.*, with —5° C. and a barometer reading of 710 or with +20° C. and a barometer reading 780. There only remains to be ascertained how much the range is increased or decreased. It may be said approximately that a change in the air density of 20 grams changes the range:

at a distance of 1000 m., about 10 m.;
at a distance of 1500 m., about 15-20 m.

(*b*) *Motion of the air.*

The stronger the motion of the air, the more the bullet will be deflected in its flight. Head wind shortens the range, wind obliquely from the rear lengthens the range and also deflects the bullet.

The effect of the wind is more difficult to estimate than the influence of the density of the air, as its direction and force not only change constantly, but also change with the elevation above the ground, and it may assume an entirely different direction and force at a distance from the firer. Gusty winds not only result in displacement of the sheaf, but also in a wider dispersion. As a basis for judging the wind and its influence on the range, the following may be of advantage:

Force of wind*	Distance	Effect on	
		Range	Sheaf, laterally
0.5–7 m. sec..... Light—moderate.....	1000 m. 1500 m.	Up to 15 m. Up to 30 m.	Up to 7 m. Up to 15 m.
8–16 m. sec..... Brisk—strong.....	1000 m. 1500 m.	Up to 30 m. Up to 70 m.	Up to 15 m. Up to 40 m.

* Judging the force of the wind appears difficult, but is very simple if powder smoke and steam from the machine gun is watched, and, at the same time, the period of one second fixed. Light dust or tobacco smoke serve the same purpose.

These figures are merely reference points and mark the approximate limits within which the displacement of the sheaf takes place. It must be considered that wind from the right will have less influence than wind from the left, as the drift of the bullet counteracts its influence. In this connection, it is to be noted that on account of the faulty setting up of the sled and the error caused by its vibration, deflection to the left may

result despite the drift to the right and wind from the left, as was incontestably demonstrated by the gun-proving board, even though drift to the right always results in deflection of the bullet to the right.

CHAPTER 11. LOW SHOOTING OF THE MACHINE GUN.

When a well adjusted machine gun fires series fire at a target and then passes to sustained fire, the sheaf of the latter is often shorter than that of the former. The cause for this is not yet satisfactorily explained, but this much has been established that in fire for effect, a range 50 meters higher than was used in series fire is generally required. With some machine guns, the sheaf does not fall at all, but with others as much as 100 meters. The platoon and gun commanders must watch their guns for this tendency during field firing and consider the observations made in selecting the sight setting.

A further falling of the sheaf in sustained fire does not occur if there is sufficient water in the jacket. Should the barrel be not sufficiently covered with water, about 2 centimeters deep, parts of the barrel will be out of the water when it boils. This results, *e.g.*, at a range of 1000 meters, in shortening the range as much as 200 meters. In addition, the sheaf in this low shooting is materially enlarged and becomes so thin that the result obtained is out of all proportion to the amount of ammunition used.

Should jams occur in a machine gun that has previously worked well, the fault lies in most cases in the shortage of water in the jacket. During these jams, the dispersion is also much greater, and at the same time the sheaf falls considerably.

It is useless to shoot while there are jams, as there can be no hits. It is better to take time to refill the water jacket at once and not fire until this is done.

PART III.

MACHINE-GUN FIRE IN TACTICAL UNITS.

CHAPTER 12. FIRING WITH MACHINE GUN OVER OUR OWN TROOPS.

Should machine guns be placed in the firing lines of our own troops, they are forced to advance by rushes with the infantry. This is, however, very difficult to execute on account of the bulk of the material (ammunition, water), and particularly on ac-

count of the necessity for an assured ammunition supply. Moreover, machine guns especially draw the hostile fire, thus exposing the accompanying infantry to heavy losses. For this reason, machine guns should, if possible, be removed from the firing line, and should be posted so that they can shoot over the heads of our troops. The enemy will thus be compelled to divide his fire between the machine guns and the firing line. Firing through the gaps of our own lines has very seldom been practicable in service; machine guns therefore always seek to shoot over the heads of their own troops.

Our own troops can be fired over with entire safety since the sled with its aiming apparatus permits of the certain control of the machine-gun sheaf. In a flat country, firing over the heads of the firing line is barred on account of the flatness of the trajectory. Theoretically, it would be practicable to fire over the heads of our troops without danger at the longer ranges on account of the height of the trajectory (see Appendix), but the line of sight would always be directed at our own troops or pass very slightly above them, so that such shooting is out of the question.

One requirement is to be able to distinguish friend and enemy from the position of the machine gun in order to prevent mistakes in observing the strike of the bullets. Elevating the line of sight 3 meters over the heads of our own troops is sufficient to exclude the possibility of endangering them.

As shooting over our own troops in a flat country, for reasons stated above, is out of the question, machine guns must try to secure commanding positions. Such positions need not be as high as those for artillery, but only high enough to permit the line of sight to be elevated 3 meters above our own firing line as above stated. For the same reason, machine guns can shoot over our troops when the enemy occupies a commanding position. A commanding position on the part of the enemy is particularly advantageous when the slope in front of his position is very steep. The steeper the slope, the longer can we fire over our own advancing troops without endangering them.

The closer our lines approach the enemy, the more care must our officers take that they do not come within the sheaves of the machine gun. For this reason, an approximate knowledge

of the vertical and horizontal diameters of the machine-gun sheaves is necessary. In the following tables, the dimensions of the sheaf with 100 meters deep fire are shown; this is the maximum deep fire permissible in firing over our own troops.

Depth of the 100 per cent machine-gun sheaf with 100 meters deep fire:

Distance in m.	Depth of the sheaf in m.	Distance in m.	Depth of the sheaf in m.
800	460	1200	260
900	385	1300	240
1000	330	1400	225
1100	290	1500	215

The 100 per cent vertical diameter with 100 meters deep fire:

At a distance of m.	100 per cent vertical diameter at a range to the target of	
	1000 m.	1500 m.
100	1	1.5
200	2	2.5
300	3	4
400	4	5
500	5	6.5
600	6	8
700	7	9
800	8	10.5
900	9	12
1000	10	13
1100	..	14.5
1200	..	16
1300	..	17
1400	..	18.5
1500	..	20

When firing over our own troops, the machine-gun barrels should not be used above 6,000 rounds.[9] The water jacket must always be full. Should the water in the jacket be cool at the beginning of the firing, 1,000 rounds can be fired without interruption from the same barrel without materially enlarging the sheaf or altering its center of impact. Further firing requires the refilling of the jacket after every 500 rounds. With barrels which have been fired beyond these limits or are insufficiently submerged in water, the beaten zone is at once enlarged by several hundred meters.

[9]If the barrel has been used for firing, and there was too little water in the gun, the barrel can no longer be used for firing over our own troops, and new barrels should be placed in the gun for such firing.

Firing through trees, brush, or even bunches of grass should be absolutely avoided, as the resulting ricochets endanger our troops. In firing over our own troops, the machine gun must be so elevated that it will be impossible for the bullets to graze the vegetation of the foreground.

The probability that in cross fire bullets will strike each other and thus endanger our own troops, is so slight that it cannot affect our firing over them in battle.

Firing over our troops has justified itself to a remarkable degree in service. All prejudices against it, held in time of peace, soon vanished.

The moral effect of firing over our own firing lines, which it was feared would be demoralizing, was on the contrary reassuring and aroused the attacking spirit, as the men know that the enemy will be covered with heavy machine-gun fire during their rushes.

The author has never observed any wounding of our men through firing over them, despite the fact the required 3 meter elevation of the line of sight was on several occasions not available.

Experiences in the field have demonstrated that the division of the hostile fire caused by firing over our own troops was always very marked; the losses were never as great as when the enemy fired on the machine gun and the firing line with the same sheaf.

CHAPTER 13. FIRING AGAINST AEROPLANES.

This chapter is not based on the report of the gun-proving board, but represents only the author's views on firing against aerial targets.

The experiences of the war in firing against aeroplanes with machine guns and infantry are so far not very encouraging. What is the cause of these poor results, if these apparent failures may be so termed?

In the following discussion, particular mistakes and rules for firing will be discussed.

(*a*) *The number of machine guns.*

Firing at aeroplanes may best be compared with shooting at partridges in hunting. Even the non-hunter knows that a

partridge is not hunted with bullets, but with shot. Why? Because a rifle bullet flies past the mark, but a sheaf is formed of the many trajectories of shot. The denser and the larger the sheaf, the greater the chances of hitting a partridge. A shot gun which compresses its sheaf in a narrow space, is indeed dense but so small and narrow that it is easier to miss with it than with a large, wide sheaf.

I will compare the dimensions of these two sheaves with a machine gun with which 100 and 300 meter deep fire is executed. Here also the 100 meter sheaf is denser, the different trajectories lying closer together. It is therefore better to use 300 meters deep fire, but the sheaf must, nevertheless, be dense, and therefore several machine guns are required. How many? The more, the better, but all guns must form one large, dense sheaf, otherwise dispersion will naturally result.

I hope in this discussion to convert those who so far employed only one or two guns. In my opinion, the simultaneous and unified employment of at least six machine guns is necessary.

(*b*) *Aiming in front of the target.*

Aim must be taken at a point as many meters in advance of the target as the target travels during the time required for the bullet to reach it. If this amount is exactly known, the required amount of windage can be taken on the sight, aim taken directly at the aeroplane, and the target kept continuously in the machine-gun sheaf. In hunting, such devices are unknown, and the hunter must determine instantly how far he has to aim in front of the target. Each individual case is also different; the target is viewed sometimes from the side, at other times straight from the front, and then again obliquely from the rear.

Differing from the shotgun, the machine-gun sheaf is continuing in point of time; necessary measures must therefore be taken during the firing as soon as the target changes its direction.

The speed of the targets also differs, one flies faster, another slower, but unfortunately this is not known, as the distance is too great to determine it.

I am, therefore, of the opinion, that those who require such an accurately measured amount of aim in front of the target, and follow the target with the sight, are on the wrong track.

From our firing so far, we can utilize to advantage against aeroplanes the many experiments which we have made against targets moving rapidly in a lateral direction. Hundreds of times we have tried to follow the target, but we always reverted to the practice of placing the machine-gun sheaf a distance in front of the target, holding it there and using deep fire until the target has passed through it. The cause of the fact that few hits were made, even with this method, lies principally in the insufficient amount of ammunition, *i.e.*, not enough machine guns were used because, as was said, "the target was not worth it." A second cause of the failure is that during the firing observation becomes possible and the gun commander shifts or narrows the sheaf (which, though thin, is correctly placed) so much that the target just passes it.

In the air, no observation is possible, and we must therefore employ a method of dispersion so great that not only will the amount of holding in front of the target be correctly estimated, but also the dispersion in depth will be so great that the target must absolutely pass through the sheaf.

More will be presently said about aiming in front of the target.

The fastest fliers—and we must reckon with this class—attain a speed of about 150 km. per hour. Such a machine, therefore, covers about 40 meters in one second. It is then necessary to aim as many times 40 meters in front of the target as the bullet requires seconds to reach the target; these factors are:

at 1000 m. about 2 sec. = 2 x 40 = 80 m.
at 1500 m. " 4 " = 4 x 40 = 160 m.
at 2000 m. " 7 " = 7 x 40 = 280 m.

How is the amount now determined? I have used the following very simple method, not only against air targets but also against any other kind:

Extend the right arm and sight with one eye at a target over the thumb; close the eye and sight with the other eye; a point will thus be obtained whose lateral distance from the target is almost exactly 100 meters at a distance of 1000 meters. Any soldier can easily keep this measurement with the eye. Make the trial. I have trained soldiers with flags set up at lateral inter-

vals, and have always found that they discovered the point immediately when I said, *e.g.*: "250 meters to the right of the lone tree!"

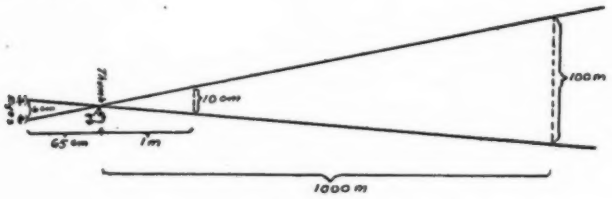


FIGURE 10.

If this is not believed, the following calculations may be convincing:

Interpupillary distance about 6 cm.;
Distance from the eye to thumb about 65 cm.;
We therefore have:

$$65 \text{ cm.} = 6 \text{ cm.}$$

$$1 \text{ cm.} = \frac{6}{65} \text{ cm.}$$

$$100 \text{ cm.} = \frac{6 \times 160}{65} = 9.2 \text{ cm.}$$

$$100 \text{ m.} = 9.2 \text{ m.}$$

$$1000 \text{ m.} = 92 \text{ m.}$$

or about 100 m., sufficiently accurate for practical purposes.

In announcing ranges, this measure of 100 meters is the unit of measure. It is immaterial whether the target is 800, 1000 or 1500 meters distant. The command, "Hold 100 meters in front of the target," means the interpupillary distance projected over the thumb. Of course, to avoid this, the command could as well be: "One width in front of the target," or any other similar command.

With the interpupillary distance as the unit of measure, I always obtain the following results:

at 100 m. about 10 m.
at 1000 m. " 100 m.
at 1500 m. " 150 m.
at 2000 m. " 200 m.

Should the flying target, therefore, pass exactly at right angles at a range of 1500 meters, it would be necessary to hold 160 = a little more than one width, or in practice:[10]

"1½ width in front of the target!"

I never had any difficulties with this target designation, but have had many when the command was: "'10' or even '20' lengths of the aeroplane in front of the target."

When the aiming point has been found, there is no difficulty in holding it with the eye. Clouds often give a most satisfactory reference point.

The height of the target can also be easily transferred laterally. The machine gun is then held on the established aiming point with sustained fire and delivers deep fire, described in the next section, until the flier has about reached this point. The process is then repeated as in the case of objects moving rapidly in a lateral direction on the ground.

Wind from the side, on which we are so dependent in the case of targets on the ground, need not be considered as the aerial target will be deflected by it nearly as much as the bullet.

(*c*) *Deep Fire.*

From section (*a*), we have already seen that it is advantageous to secure a large, wide sheaf. Deep fire from 1500 to 1200 meters, *i.e.*, 3 lines, is recommended. If this is tested with the sight settings, it will be found that it is a very deep fire, but it can be easily executed with the right hand.

This deep fire is always used against aeroplanes, regardless of whether the firing is at 800, 1000 or 1500 meters.

The sheaf is thus of constant dimensions with the following vertical diameters:

at 500 m. = 10.4 m.
at 1000 m. = 20.9 m.
at 1500 m. = 31.2 m.

The machine guns thus cover with their sheaves a space which aeroplanes can hardly pass.

They will be unable to escape such a great sheaf by rising and descending (gliding), because they neither see nor hear it.

[10]See calculations on page 195.

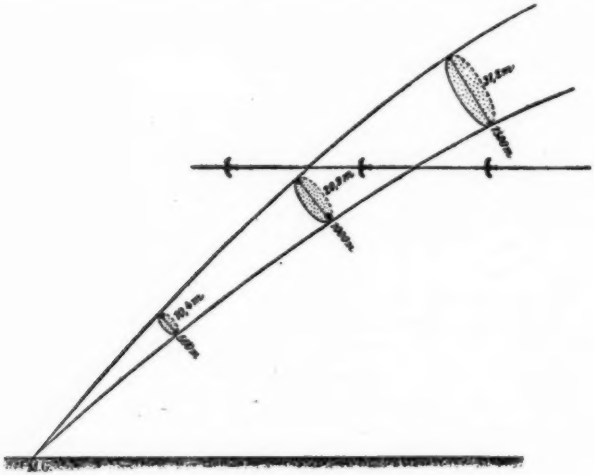


FIGURE 11.

It is therefore only necessary to bring the sheaf in front of the target.

(*d*) *Distance.*

It has been often asserted that the distance to an aeroplane could be estimated after some practice. I admire such artists, but I doubt their skill, since—

1. Aeroplanes are of different sizes.
2. Aeroplanes do not always present their broad sides; their length is therefore not always shown.
3. No reference points for estimates exist in the air, in contrast to estimating distance on ground.

It is my opinion that the distance to an aeroplane can never be estimated with any degree of accuracy or certainty.

As a basis for firing against aeroplanes, I consider that the range finder must be relied on in addition to the method already described.

The speed of the aeroplane does not in the least alter this. Should the aeroplane be headed directly toward the machine gun, this must be considered in determining the range.

If no range finder is available, or if it is impossible to obtain

the range to the aeroplane, it is much better not to shoot at all, as it would be a waste of ammunition to do so.

Are there indeed such great changes in the distance?

In the next section, this question will be more fully discussed, but it may here be said that this is only the case when the aeroplanes fly very low. High-flying targets, even when they are visible at 80°, always present a kind of a laterally moving target at which aim must always be taken as much in front as if the target were flying in a lateral direction.

(*e*) *Altitude Angles.*

Aeroplanes fly at an altitude of at least 1000 meters while reconnoitering, but this is an exceptionally low limit. We are mostly concerned with targets at an altitude of from 1500 to 2000 meters.

In examining Figure 12, it is seen that angles of 10-30° do not occur at all; they could be considered only as exceptional cases with which we do not have to reckon.

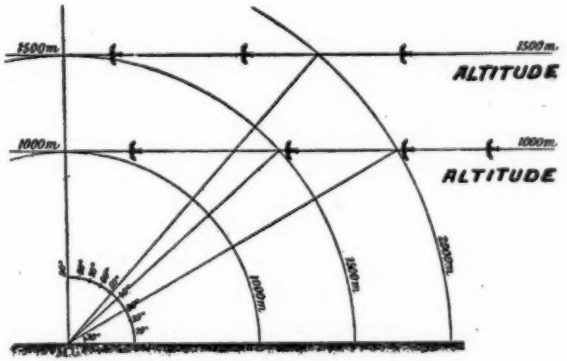


FIGURE 12.

A flying target at an altitude of 1000 meters and a distance of 1500 meters flies at an altitude angle of 40°. A flying target that flies at an altitude of 1500 meters is directly above the machine gun when it is at a distance of 1500 meters. We are therefore concerned with targets which appear, in general, at altitude angles of from 40 to 90°.

Are we able to obtain results against a target flying at such altitudes?

If we take the stand that it is impossible for us to do anything against these aeroplanes, and therefore as a rule do not open fire, they will soon fly lower, and we shall have to reckon more than would otherwise be the case with the well known bombs. We must, therefore, do our best to keep off the aeroplane as far as we can with our ammunition.

I maintain that we can have very good results up to 1500 meters, just as against targets on the ground.

The strong air currents, of which so much is said, exist in general only when there is also a strong wind on the ground. By observing the clouds, it is easily seen whether or not there is a strong wind. In very stormy weather, the clouds generally hang low, and the aeroplanes are compelled to fly lower if they wish to observe anything. It all depends on the ability to bring the target into a systematically laid and very dense sheaf; we have then excellent prospects of hitting the flier, even at distances of 1500 or 1800 meters, regardless of the altitude angle.

I would never call such firing waste of ammunition.

(f) Range Selection—Instruments for measuring angles.

Everyone knows that in firing with a great angle of elevation, a lower sight setting than the actual range must be used, until finally at an altitude angle of 90° nearly point blank range is used.

Several such tables have been "calculated," but unfortunately none have been actually "fired." It is not so very simple to place a target at a distance of 1500 meters at an altitude angle of 70°. Great elevations and short distances prove nothing.

For the present, we must be satisfied with a calculated range table, *e.g.*, the one calculated by v. Burgsdorff. Should there be errors in the table, the great deep fire will equalize them.

The table alone does not answer the purpose of the machine gun, we must also add the upper half of the deep fire. As, however, we fire with one and the same sheaf at all distances—from 1500 to 1200 meters—and this, therefore, represents a fixed quantity, I have added half of the angle of the coarse deep fire to the table of v. Burgsdorff. The result is the following table:

RANGE TABLE FOR MACHINE GUN FOR USE IN FIRING AGAINST FLYING TARGETS.

Measured distances*	Range to be announced at†					100 per cent vertical diameter‡
	40°	50°	60°	70°	80°	
800 m.	1000	950	900	850	800	16.7 m.
900 m.	1050	1000	950	900	800	18.8 m.
1000 m.	1150	1100	1000	950	850	20.9 m.
1100 m.	1200	1150	1050	1000	850	22.9 m.
1200 m.	1300	1200	1150	1000	900	25.0 m.
1300 m.	1350	1300	1200	1050	950	27.0 m.
1400 m.	1450	1350	1250	1150	950	29.1 m.
1500 m.	1500	1450	1350	1200	1000	31.2 m.

* Measured, not estimated.
† Including the coarse deep fire of 1500 to 1200 m.
‡ Of the large sheaf of the deep fire from 1500 to 1200 m.

If, therefore, it is desired, for example, to fire with 50° altitude and 1300 meters measured distance, the command is given: "Range 1300—3 lines," or with 80° altitude and 1400 meters distance: "Range 950—3 lines."[11]

It is now only necessary to determine the angle at which the target is viewed. Until "angle finders" are available, machine-gun troops have to resort to their own devices. A simple piece of board from which a bullet is suspended by a string is sufficient.[12] The table is pasted on the board.

The use of the angle finder is contingent upon the range finder; without the latter the former is valueless.

(*g*) *Firing Without Deep Fire.*

Deep fire is not appropriate for firing against flying targets which are headed directly towards us and which will, therefore, finally be directly over us; broad fire must here be used in order that the shots may not pass by the target. The extent of the broad fire to be used is dependent on the deflection of the bullets by the wind. To meet all cases, I recommend a broad fire on each side of one-half of the eye and thumb measure, or in total, an entire width. This amount is, of course, very great, but in this way, it is nearly impossible for the flying target to pass by the sides of the sheaf.

I intentionally do not recommend to aim at *one* side against the wind, but on *both* sides, as in firing such great altitude angles,

[11] On the graduated scale.
[12] After the fashion of an improvised clinometer.—Editor.

errors are easily made and the wind conditions are often wrongly estimated. Here again the old principle applies: "The more machine guns, the better."

(*h*) *Closing Remarks.*

The final objection of those who do not believe in the success of machine guns is the familiar statement that only "chance shots" can hit an aeroplane.

The term, "chance hits," sometimes does a good deal of harm. One may even maintain that every shot, not called as a bull's-eye, is a chance hit. I differ. A hit within a systematically laid sheaf is not a chance hit, but is based on calculation. If we fire with a machine gun against small targets at 1000 meters, with sight set at 1050 meters and 1 line (deep fire), it cannot be called accident if the enemy is hit. By accident, I understand when at 2000 meters, a high, stray bullet hits a man. This is a chance hit.

If we succeed in placing the sheaf correctly on the target, it is good luck when a projectile hits part of the machine, or even the flier himself, in such a manner as to put the machine *hors de combat*. The denser the sheaf, the better the prospect of attaining such a result.

I have no doubt at all that such shooting is possible with machine guns. Of course, well-trained gun pointers are essential, but this can be easily accomplished in a machine-gun company when only one man per gun need be considered, much more thoroughly and easily than in the infantry.

APPENDIX.

Average Ordinates in Meters of Trajectory Above Horizontal Line of Sight.

SIGHT SETTING	RANGES																																
	50	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700
400	0,15	0,25	0,35	0,35	0,35	0,30	0,20	0	−0,30	−0,65																								
500	0,20	0,40	0,55	0,65	0,70	0,70	0,65	0,50	0,30	0	−0,40	−0,85																						
600	0,30	0,50	0,75	0,90	1,05	1,10	1,15	1,10	0,95	0,70	0,40	0	−0,50	−1,20																				
700	0,35	0,70	1,00	1,25	1,45	1,65	1,75	1,75	1,70	1,55	1,35	1,00	0,55	0	−0,75	−1,70																		
750	0,40	0,80	1,15	1,45	1,70	1,90	2,05	2,15	2,15	2,05	1,90	1,60	1,20	0,65	0	−0,90	−1,85																	
800	0,45	0,90	1,30	1,65	2,00	2,25	2,45	2,60	2,65	2,60	2,50	2,25	1,95	1,45	0,75	0	−1,00	−2,20																
850	0,50	1,00	1,45	1,90	2,25	2,60	2,85	3,05	3,15	3,15	3,10	2,95	2,65	2,25	1,65	0,90	0	−1,15	−2,55															
900	0,60	1,15	1,65	2,15	2,60	2,95	3,30	3,55	3,75	3,80	3,80	3,70	3,50	3,15	2,65	1,90	1,05	0	−1,35	−2,9														
950	0,65	1,30	1,85	2,40	2,95	3,40	3,80	4,15	4,35	4,50	4,55	4,55	4,40	4,15	3,70	3,05	2,25	1,30	0	−1,50	−3,25													
1000	0,75	1,45	2,00	2,70	3,30	3,85	4,30	4,70	5,00	5,25	5,40	5,45	5,40	5,30	4,80	4,25	3,50	2,60	1,40	0	−1,70	3,65												
1050	0,8	1,6	2,3	3,1	3,7	4,3	4,9	5,4	5,8	6,1	6,3	6,4	6,4	6,3	6,0	5,5	4,9	4,0	2,9	1,6	0	−1,9	−4,1											
1100	0,9	1,8	2,6	3,4	4,3	4,8	5,5	6,0	6,6	6,9	7,2	7,5	7,5	7,5	7,3	7,0	6,4	5,6	4,6	3,3	1,8	0	−2,7	−4,7										
1150	1,0	2,0	2,9	3,8	4,7	5,4	6,2	6,8	7,4	7,9	8,3	8,6	8,8	8,8	8,7	8,4	8,0	7,3	6,4	5,2	3,8	2,0	0	−2,4	−5,3									
1200	1,1	2,2	3,3	4,2	5,2	6,0	6,8	7,6	8,3	9,0	9,5	9,8	10,1	10,2	10,2	10,1	9,7	9,1	8,3	7,2	5,9	4,3	2,3	0	−2,7	−5,9								
1250	1,2	2,4	3,6	4,6	5,7	6,7	7,6	8,5	9,3	10,0	10,6	11,1	11,5	11,8	11,9	11,8	11,6	11,1	10,4	9,4	8,2	6,7	4,9	2,6	0	−3,0	−6,5							
1300	1,3	2,6	3,9	5,1	6,3	7,4	8,4	9,4	10,3	11,1	11,9	12,5	13,0	13,4	13,6	13,6	13,5	13,2	12,5	11,7	10,6	9,2	7,5	5,4	2,9	0	−3,4	−7,3						
1350	1,5	2,9	4,3	5,6	6,9	8,1	9,3	10,4	11,4	12,4	13,3	14,0	14,7	15,3	15,5	15,6	15,6	15,4	14,9	14,2	13,3	12,0	10,5	8,5	6,1	3,3	0	−3,8	−8,0					
1400	1,6	3,1	4,7	6,1	7,6	8,9	10,2	11,5	12,6	13,7	14,7	15,6	16,4	17,0	17,5	17,8	17,9	17,9	17,5	16,9	16,1	15,0	13,6	11,7	9,4	6,8	3,8	0	−4,1	−8,6				
1450	1,7	3,4	5,1	6,7	8,3	9,7	11,2	12,6	13,9	15,2	16,3	17,3	18,3	19,0	19,6	20,1	20,3	20,4	20,3	19,7	19,0	18,0	16,7	15,0	12,9	10,4	7,4	3,9	0	−4,4	−9,3			
1500	1,8	3,7	5,5	7,3	9,0	10,6	12,2	13,7	15,2	16,6	17,9	19,1	20,2	21,1	21,8	22,4	22,8	23,0	23,0	22,6	22,1	21,2	20,0	18,5	16,6	14,2	11,3	8,0	4,3	0	−4,8	−10,2		
1550	2,0	4,0	6,0	7,9	9,7	11,6	13,2	15,0	16,6	18,1	19,6	20,9	22,2	23,3	24,2	24,9	25,4	25,7	25,9	25,7	25,4	24,7	23,6	22,2	20,4	18,3	15,5	12,3	8,7	4,6	0	−5,3	−11,2	
1600	2,2	4,3	6,5	8,6	10,5	12,5	14,5	16,3	18,1	19,8	21,4	22,9	24,3	25,5	26,7	27,6	28,3	28,7	29,0	29,0	28,8	28,3	27,4	26,1	24,5	22,5	20,0	17,0	13,5	9,5	5,1	0	−5,8	−12,2

Notes on Instruments.[1]

FOR the proper observation and control of the fire of modern arms, it is necessary to use certain instruments. The instruments discussed in these notes are those required for observation, direction, and control of the fire of the rifle and machine gun. Conditions of field service require that these instruments be few in number, rugged in construction, and simple to use. In general, the field glass is required for observation of the terrain and the effect of fire; some form of instrument, such as the mil scale, is required for determining angles; and the range finder is required, or at least is desirable, for determining ranges.

THE FIELD GLASS.

The binocular glass consisting of two complete optical systems, connected by a rigid or hinged frame, is universally used for military purposes. However, if one of the two optical systems should be damaged, or if parallelism of the two systems should be destroyed by accident to the frame or displacement of the lenses or prisms, it is well to remember that the field glass can still be used effectively as a monocular.

The two types of field glasses in common use are the Galilean glass and Porro prism glass.

THE GALILEAN GLASS.

The Galilean glass has convex objectives and concave eye-pieces. It is of low power but requires careful focusing.

The Galilean glass is of low power (magnifying from 2 to 5 diameters), and is a comparatively inexpensive instrument. The type A and type B glasses of the Signal Corps are examples of this form of field glass. Figure 1 shows diagramatically the arrangement of lenses in the Galilean glass.

In this field glass, the rays from an object are converged by the object glass *O*, and would normally focus at the focal plane *C* and there form the inverted image *ba*, were it not that the double concave eye glass or ocular *D* is so located in the barrel of the glass

[1] First of a series of papers prepared at the School of Musketry. Furnished by courtesy of Colonel R. M. Blatchford, Infantry, Commandant of the School.

as to intercept the pencils before they are focused. This double concave eye glass diverges these pencils and forms a magnified erect image *ab* apparently at *E*.

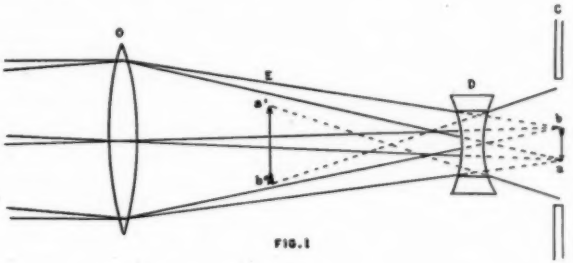


FIG. 1

Due to the diverging action of this concave eye lens, the cone of the pencils entering the eye is larger than the pupil of the eye, and therefore but a small part of the field gathered by the object glass is utilized, which causes field glasses of this type to have comparatively small field of view.

In the Galilean type of field glass, the two optical systems are usually mounted rigidly and a single focusing screw moves both eye-pieces in or out for adjustment of the focus only. The concave eye-piece lenses are quite large, and for ordinary eyes, accurate adjustment for interpupillary distance is therefore unnecessary. This means that the two lens tubes do not have to be hinged so that their distance apart can be adjusted to correspond with the distance apart of the pupils of the eyes.

The optical principle of the Galilean glass makes it necessary to change the focus for maximum enlargement when viewing objects at different distances, unless these distances are several hundred yards or more. With this glass, the eye, by being strained, can get a temporary focus with wrong adjustment of the eye-pieces, but this is very hard on the eyes, and the glass may seem to go out of focus after a time, because of eye fatigue and inability to keep up the strain. For this reason, the focusing of Galilean glasses should be done carefully and in the following manner: Start with the eye-pieces well in; turn the focusing screw until the field is in apparent focus and then go on beyond about one turn of the screw. Then very slowly turn the screw back until the focus is obtained again. If the glass is the personal property

of the user, it is well to put a mark on the barrel corresponding to the correct focus for a range of about 500 yards. It will then be correct for everything beyond that distance. If the user's eyes have markedly different optical characteristics so that the broad focus of this type of glass will not be approximately correct for each eye, he will have to obtain a glass of the prism type with separately adjusted eye-pieces. However, there are glasses of the Galilean type, of foreign manufacture, with interpupillary adjustment and separately adjustable eye-pieces and, if a glass of the Galilean type is preferred, it may be possible for one with abnormal eyes to obtain one of these foreign glasses.

THE PORRO PRISM GLASS.

The Porro Prism Glass has convex objectives and eye-pieces and prisms for erecting the image and shortening the length of the glass. It can be built of the highest powers and has a practically universal focus.

In the astronomical telescope, which consists simply of a convex object glass and a smaller convex eye-piece, the image is magnified but is inverted. It is possible to erect this image by a system of erecting lenses, but this increases the length of the telescope and usually decreases the brilliancy of the image and the clearness of definition.

In 1850, Porro, a French engineer, discovered a combination of two prisms which, when inserted between the object glass and eye-piece of an astronomical telescope, showed the image erect or in its natural position. These prisms have an additional advantage: the ray is twice turned upon itself and the telescope can, in

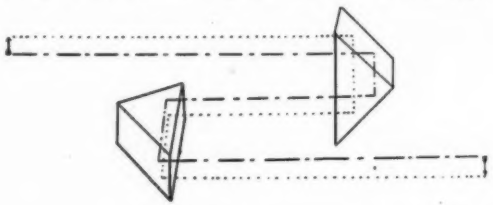


FIG. 2

consequence, be shortened. Figure 2 shows the path of rays through the prisms, and the reason for the erection of the image is evident.

The Porro prism glass has two advantages inherent in the astronomical telescope. It is possible to get a large magnifying power combined with a large field of view. In addition, by the use of prisms, the glass can be reduced in size to very small dimensions. For these reasons, it makes the ideal glass for military purposes, and most officers' glasses are of this type. The Signal Corps furnishes four glasses of this type, viz: Type C, 10 power; Type D, 8 power; Type E, 6 power, and Type EE, similar to Type E, but equipped with a mil scale in the field and with certain other constructional refinements. A special sight scale in addition to the mil scale has been applied to the type EE glass and will be discussed later.

The glasses of the prismatic type were, until a short time ago, invariably of foreign design. They are usually built with a jointed frame and can be adjusted so that the distance between the optical axes of the eye-pieces can be made exactly that of the distance between the pupils of the user's eyes. There is a scale at the joint with figures 60 and 70 and intermediate divisions. The normal interpupillary distance is about 64 millimeters (2½ inches), and this scale shows the distance between the optical axes of the eye-pieces in millimeters. Many glasses have an adjustable ratchet or stop which drops into a notch, and being once set for a certain interpupillary distance, the glass can be opened until the stop drops into its notch, and the interpupillary distance will be correct for the user. To determine interpupillary distance, point the glasses at the sky and open and close the joint until the field ceases to be two overlapping circles and appears to be one sharply defined circle. The interpupillary distance can then be read in millimeters from the scale at the joint. If you know this constant for your own eyes, you can at once set it off on the joint scale of a strange pair of glasses, otherwise the determination must always be made and the glasses adjusted for interpupillary distance before attempting to use strange glasses.

All prism glasses have independent focusing arrangements for each eye-piece. In some types, both eye-pieces focus with one screw, and in addition, one of the eye-pieces has an independent adjustment. In other types, each eye-piece is independently adjustable, and there is no common adjusting screw. An index is generally engraved on the barrel, and the eye-piece screws in and out, a scale with a middle zero being engraved on its circum-

ference. Each division of the scale corresponds to a movement in or out of ⅓ millimeter, the movement outward or lengthening the focus being indicated as + and the opposite movement being indicated as —. For a person with normal eyes, a prism glass with eye-piece scales set at 0 is in focus for everything between about 50 feet and infinity. If the eyes are not normal, or in any case with a new glass, each optical system should be focused separately on some object several hundred yards distant after the interpupillary distance has been carefully determined and adjusted. If the glass has the common adjusting screw and a scale on but one eye-piece, the eye-piece without the scale should be focused first, and then the other eye-piece adjusted by turning it without touching the common adjusting screw.

A person with one or both eyes abnormal may instantly focus any prism glass if he remembers and sets off on the eye-piece scales the same readings that he uses on his own glasses.

CARE AND PRESERVATION.

The ordinary military field glass is a rugged, serviceable instrument. Occasionally, screws work loose, and all screws should be periodically tightened. In hot, moist climates, there is a tendency for the canada balsam cement between the lenses of the object glasses to deteriorate, and this causes spots on the object glass, but unless the damage is extensive, the glass is still usable.

The majority of cases of damage to field glasses, especially those of the prism type, can be traced to the fact that they have been taken apart by their owners, who have been unable to put them together again with the exact original adjustment. It is practically never necessary to open a pair of field glasses for cleaning or otherwise, and when it is necessary, the work should be done at a factory, or by an expert with the proper tools to handle the job.

If a glass has been damaged by a fall or blow, and a duplication of the image occurs, it is sometimes possible to correct this by seizing one of the lens tubes in each hand and while looking through the glasses, cautiously twisting or turning the hands until the duplication disappears. It is never possible to entirely and permanently correct duplication by this means, and it is better to return glasses to makers for overhaul at the first opportunity.

The exposed surfaces of the object and eye-piece lenses should be kept clean by being occasionally wiped lightly with a soft clean cloth very slightly moistened with water or alcohol. The lenses can be scratched by dust or grit on the cloth if they are rubbed vigorously, and if alcohol is used, one must be careful not to get it on the lacquer of the frame and the lens holders.

CHARACTERISTICS OF A GOOD FIELD GLASS.

The standards for comparison of field glasses are based on the capabilities of the unaided normal human eye. There are four properties, measurable by these standards, that every field glass has, viz: power, light, field, and definition.

Power.

The power of a field glass is defined as the ratio of the diameter of an object as seen through the glass to the diameter as seen by the unaided eye.

The power of a field glass can be determined with sufficient accuracy by focusing the instrument on a wall or preferably a range rod at least 200 yards distant. By looking at the object through the instrument with one eye and at the same time viewing the object with the other unaided eye, it is possible to make a comparison of the apparent length or height of the two images. The ratio of the two is the power of the glass.

The actual power of most glasses varies more or less from the power marked on them, but it is in cheap glasses that the greatest discrepancy is found.

For the mounted man, a glass of but 4, or at most 6, powers can be used to advantage; on foot with free hand, instruments of not to exceed 10 powers can be used. If more than 10 powers are desired, a holder or tripod becomes necessary, and if the holder is intended to be portable, a greater power than 30 is not practicable, as the movements of the air or the slightest touch of the hands sets up vibration that renders clear vision impossible.

Light.

The illumination of an object when observed with the unaided eye is impressed upon the retina with a brightness in strict proportion to that of the object itself. If an object be viewed under equal illiuminating conditions alternately with the unaided eye

and with a glass, the brightness of the object seen with the naked eye may be represented by 1, while that of the image in the glass will generally differ, being more or less bright. Light is a function of the dimensions of the object glass, of the power of the instrument, and of the dimensions and character of the media, such as prisms or erecting lenses, interposed between the object glass and eye-piece. There is no easy method of measuring this property except with special instruments, but in glasses of the same general type, the light varies directly as the square of the effective diameter of the object glass and inversely as the square of the power.

Field.

The field of the human eye for perception only is at least 90°, but for *distinct* vision it is much smaller, say 45°. This corresponds to a field of 800 feet in diameter at 1000 feet, but this field varies greatly with individual eyes.

The field of a field glass is always smaller and is, in any but very inferior glasses, sharply defined and capable of exact measurement. To measure the field of a glass, stake out a *T* on any convenient level ground. The stem of the *T* is, for convenience in obtaining results without calculation, laid out 1000 feet in length.

Figure 3 shows the arrangement and dimensions of the *T* in conventional perspective.

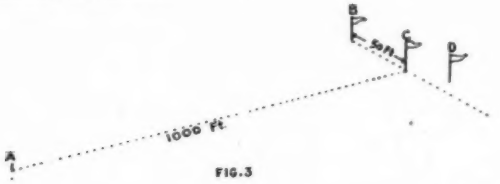


FIG. 3

The observer with the glass stands at *A* and holds the glass so that the pole *B* is just visible at the left hand edge of the field. An assistant moves pole *D* until the observer notes that it is just visible on the right hand edge of the field. The assistant is then signaled to halt and make any fine adjustments of the position of the pole *D* as signaled from *A*. The assistant keeps pole *D* lined in on pole *B* and *C*. The distance *BD* is then measured with a tape in feet and is the field of the glass in feet at 1000 feet or in yards at 1000 yards or in mils. If the distance *BC* is laid out

exactly 50 feet, the distance *CD* plus 50 feet equals *BD*. If it is desired to reduce this value to angular measure, we may use the formula—

$$\frac{BD}{2AC} = \tan \tfrac{1}{2} \text{ "visual angle."}$$

Definition.

The most important and essential quality of a field glass—and the quality most frequently neglected in choosing a glass—is definition, that is, the sharpness, the clearness, and the purity of the images seen through it.

To obtain good definition, it is necessary that spherical and chromatic aberration be overcome, that the polish of the lenses be as perfect as possible, that the lens cement possess no inequalities, that the lenses (and prisms, if any) be well focused and rigidly mounted with reference to one another, and generally, that the instrument be without optical defect.

Faults in this direction are discovered at once by examination of definition, whereas in determining the other constants, they are hardly noticeable. In comparing the definition of any two instruments, it is ordinarily necessary only to scan distant objects and observe to what extent details may be distinguished.

The following tests may also be used: Focus on printed matter at a distance just beyond that at which perfect clearness is given and gradually approach until the letters are distinctly defined. The instrument with which the print can be read at the greatest distance has the best definition. The best results are obtained with this test when large print, say an inch or more in height, is used as test type and the distance is considerable.

An absolute measure of definition can be found by preparing and posting up, in a good light, a sheet of white paper ruled with black lines one-tenth inch wide and the same distance apart. The observer examines the test sheet with the glass, moving away from it until the lines are just on the point of appearing blurred. The distance is then measured, and a simple calculation gives the definition in angular measure.

For example, suppose the distance at the blurring point is 38 yards. The calculation required is to determine the value in seconds of an angle subtended by a chord of one-tenth inch at a radius of 38 yards. The circumference of a circle whose radius is

38 yards is 238.76 yards, or 85953.9 tenths of an inch. But a complete circle contains 360 degrees or 1,296,000 seconds. One-tenth of an inch therefore equals 1,295,000″ divided by 85953.9, or 15.1″. With this glass, we therefore have definition with objects subtending an angle 15.1″, whereas the unaided eye only defines objects subtending angles of 40″ or more.

SUGGESTIONS FOR USE OF GLASSES IN THE FIELD.

The eyes of a person unaccustomed to the use of field glasses soon tire when using glasses, and his observation powers may be less than if he were using the eye alone. It is important that persons required to use glasses practice with them frequently and that the glasses be accurately focused at all times. In using the glasses, they should be held with both hands, pressed firmly enough to the eye sockets to keep the relation with the eyes constant, but not so tight as to impress on them the beating of the pulse or the body tremors.

It must be remembered that in using glasses, the eye is looking through a microscope at a tiny image of the distant objects. It is therefore working under entirely different muscular conditions from those obtaining when it is looking directly at distant objects. Long-continued observation with glasses, even under the best conditions, is a decided strain on the eyes and may result in dizziness and headaches, particularly in a novice or with badly focused glasses or glasses with poor definition.

The observer should use the glasses as little as possible consistent with the work in hand and take every opportunity to rest the eyes. Officers in charge of observing parties on work requiring continuous observation should see that observers are frequently relieved and should use consideration with men who complain of eye strain or headaches from the use of field glasses.

Machine-gun platoons are equipped at present with a 10-power glass. Some men find it impossible to hold a glass of this power steady enough with the hands alone for proper observation. This is largely a matter of practice, but for those who have difficulty in the use of these high-power glasses, a rest is recommended. This may consist of a simple rod with means of attaching it to the glass and permitting of a movement of the glass in azimuth and elevation. The rod may be forced into the ground or merely rest on the surface. The rod should be adjust-

able in length to permit of use while standing or kneeling; its use in the prone position is unnecessary.

INSTRUMENTS FOR DETERMINING ANGLES.

The mil, the angle whose tangent is .001, is the angular unit used in this course.

For the computations required in the control of fire, the system of angular measurement in terms of degrees, minutes and seconds, would be very cumbersome. A much more satisfactory angular unit is the mil. This is the angle whose tangent is .001. Its value in the conventional angular measure is 3′ 26.2″. The mil used in the artillery is an angle of 3′ 22.5″, which is arrived at by dividing the circumference of a circle into 6,400 parts. This is a sufficiently close approximation to the true mil and greatly simplifies the manufacture of the scales of such instruments as the battery commander's telescope and panoramic sight.

The mil is used for target and sector designation and in estimating ranges and occupied fronts in terms of yards or men. An object one yard long at a distance of 1,000 yards subtends an angle of one mil. The mental calculation of problems involving the solution of triangles is easy if the following equations are kept in mind:

$$(1)\ R \text{ equals } \frac{W \times 1{,}000}{M}$$

$$(2)\ W \text{ equals } \frac{R \times M}{1{,}000}$$

$$(3)\ M \text{ equals } \frac{W \times 1{,}000}{R}$$

Where R equals range in yards, W equals width or height in yards, M equals number of mils subtended by W.

The following examples of the use of these formulæ indicate their practical use:

Example I (estimation of range):

A certain tree is estimated to be 15 yards high. It covers an angle of 25 mils. It is therefore 600 yards away, for:

$$R \text{ equals } \frac{W \times 1{,}000}{M} = \frac{15 \text{ yds.} \times 1{,}000}{25} = \frac{15{,}000}{25} = 600 \text{ yards.}$$

The telegraph poles seen on a distant railroad running at right angles to our line of sight are known (from previous measurement of such poles), to be 44 yards apart; the distance between two adjacent poles is observed to be 40 mils; the range to the railroad is, therefore, 1,100 yards, for:

$$R = \frac{W \times 1{,}000}{M} = \frac{44 \text{ yds.} \times 1{,}000}{40} = 1{,}100 \text{ yards.}$$

Example II (estimation of fronts):

A line of skirmishers at about one man per yard of front covers 40 mils of the scale; the range is known to be 800 yards; the number of men is therefore 32, for:

$$W = \frac{R \times M}{1{,}000} = \frac{800 \text{ yds.} \times 40}{1{,}000} = \frac{32{,}000}{1{,}000} = 32 \text{ yards (or men).}$$

A column of infantry in "fours" is seen by a patrol at a range of 1,200 yards. It is moving across his front and covers 120 mils from head to rear of column. How many men are in the column?

$$W = \frac{R \times M}{1{,}000} = \frac{1{,}200 \text{ yds.} \times 120}{1{,}000} = \frac{144{,}000}{1{,}000} = 144 \text{ yards.}$$

At two men per yard, the column contained 288 men.

Example III (determination of mils in distributing fire):

A hostile force known to consist of about 100 men is deployed in position 1,000 yards away but so concealed that its flanks cannot be seen or determined definitely. The company commander decides to cover a front of 200 yards with his fire, 100 yards on each side of a visible group of heads in the hostile line. How many mils should be covered?

$$M = \frac{W \times 1{,}000}{R} = \frac{200 \times 1{,}000}{1{,}000} = 200 \text{ mils.}$$

A machine-gun platoon known to comprise two guns is concealed at a range of 900 yards, with one of its guns visible through glasses. The company commander decides to cover a front of 50 yards on each side of the visible gun. How many mils should be covered?

$$M = \frac{W \times 1{,}000}{R} = \frac{100 \times 1{,}000}{900} = 111 \text{ mils.}$$

Where it is possible to measure off a distance D directly toward

or away from an object which subtends a fairly large angle (50 to 300 mils), we may use a formula derived from formula (1) and which does not contain W; in other words, in this case the width of the object or its height does not have to be known. When the distance is measured toward the object, the formula is—

$$R = \frac{D \text{ times 2d mil measurement}}{\text{2d mil meas. minus 1st mil meas.}}$$

When this distance is measured away from the object, the formula is—

$$R = \frac{D \text{ times 2d mil measurement}}{\text{1st mil meas. minus 2d mil meas.}}$$

Example IV:

From this point, a hostile trench measures 150 mils. A scout goes forward 330 paces (300 yards) and finds that the trench covers 200 mils. The range from this point to the trench is therefore 1,200 yards.

$$R = \frac{300 \times 200}{200 - 150} = \frac{60{,}000}{50} = 1{,}200 \text{ yards.}$$

We have come to a river bank, and a village across the river covers 150 mils. An observer walks back 200 yards keeping our party on the river bank in line with the village and finds that at that point the village covers but 120 mils. The range from the river bank to the village is therefore 800 yards.

$$R = \frac{200 \times 120}{150 - 120} = \frac{24{,}000}{30} = 800 \text{ yards.}$$

Mils are most conveniently measured: (a) with a field glass fitted with mil scale; (b) with a mil rule; (c) for units of 50 mils, with the rifle sight.

The most accurate and convenient instrument for measuring mils is the field glass fitted with a mil scale. The type *EE* glass of the Signal Corps is so fitted. The mil scale is engraved on a thin glass reticule which is accurately placed in the focal plane of the object glass. As a result, the scale and distant field of view are in focus at the same time, and the scale can be superimposed on any object in the field of view by a slight movement of the glass.

But for target and sector designation, it is essential that every man firing have some mil-measuring instrument in order to inter-

pret and carry out the orders of his superiors when these orders are given in mils. The Small Arms Firing Manual suggests the use of the finger held at arms length as a unit, but the rear sight of the rifle is a much more satisfactory unit. The rear sight of the service rifle is 0.7 inch wide. If the eye of the firer is placed at 14 inches from the rear sight, *i.e.*, over the comb of the stock, the sight will then subtend an angle of

$$\frac{0.7 \times 1{,}000}{14} = 50 \text{ mils.}$$

Similarly, the service pistol, cal. 45., can be used for measurement of angles in terms of "sights." The aperture of the trigger guard is 0.95 inch in width. If the pistol be held with barrel vertical and butt to the right at a distance of 19 inches from the eye, the aperture of the trigger guard subtends an angle of one "sight" or 50 mils. The distance of 19 inches may be obtained at first by use of a measured cord, one end of which is held in the teeth and the other in the hand grasping the pistol butt, but after a little practice, the pistol can be held at the proper distance without the use of the cord. An officer can by this means obtain the angular data for his orders and estimations in terms of "sights" and fractions thereof, even if not provided with a mil rule or a field glass with mil scale.

A short ruler with a cord 15 inches in length forms a convenient mil-measuring instrument. Its graduations are calculated from formula (2).

This ruler is held in one hand with the knot held in the other under the eye, the cord stretched, and the graduated edge of the rule superimposed on the field under observation, one eye being used for noting space covered by the distant object on the scale. Another type of ruler will be considered later.

The windage scale on the rifle sight may be used for throwing the fire a matter of 25 mils or less to the right or left of the point of aim. The value of a point of windage is 43.11 inches at 1,000 yards, or about $1^1/_6$ mils. It is sufficiently accurate to consider a point of windage as 1 mil and full scale deflection of 21 points as 25 mils.

Range correction and sight setting for fire by means of auxiliary aiming points is best done with some device based on the scale of sight-leaf graduation of the rifle.

The theory upon which any such device is constructed will be understood by reference to Figure 4.

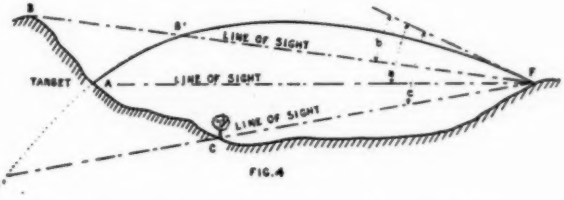


FIG. 4

The figure shows a cross section through two hill features with the firer at F and the target at A (1,000 yards distant from F). It also shows two possible aiming points at B and at C and the trajectory necessary to hit the target at A.

Case I: The target at A is clearly visible. The rifle is therefore aimed directly at the target with sight setting 1,000 yards. The line of sight is the line FA, the angle of departure is the angle a and the trajectory is the line $FB'A$ which the bullet travels and so strikes the target at A as intended. No matter what auxiliary aiming point is used, the bullet will travel this same trajectory and strike at A when the appropriate sight setting is used. For example:

Case II: The target A is invisible except through glasses. Aim cannot now be taken at the target, and an auxiliary aiming point is necessary. At C is a well defined point. If the rifle is aimed at C, the desired trajectory will be produced when the angle of departure is c, the line of sight FC and the "range" on the sight is equal to FC'.

Class III: The target at A is invisible and the skyline at B is chosen as an aiming point. If the rifle is aimed at the point B with an elevation b, the line of sight will be FB, the angle of departure will be b, and the bullet will travel along the trajectory $FB'A$, passing the line of sight at the range FB' and striking the target A as desired.

The angle of departure c used in Case II is made up of the angle of departure a necessary to hit A when aiming directly, plus the angle of site AFC. To determine the total angle c, therefore, it is necessary to know the angle a, and to measure the angle of site AFC. The angle a is known by reference to a table of fire for the

given rifle and ammunition, and the angle of site may be measured in the same unit (degrees, minutes, etc.) by an angle-measuring device, such as a transit or sextant. A much simpler method, however, is to use the rear-sight leaf of the rifle held upside down at a distance from the eye equal to the sight base of the rifle, 22.125 inches; for the angle a in terms of yards is marked on the leaf by the intercept between the zero of the scale and the graduation marking the true range to the target, and the angle of site may be read on this improvised angle-measuring instrument between the graduation marking the true range and the graduation opposite the auxiliary aiming point C when holding the sight leaf the proper distance from the eye with the true range graduation laid on the point A. With the leaf so held, the auxiliary or artificial range to be used (angle c), may be read directly as shown in Figure 5.

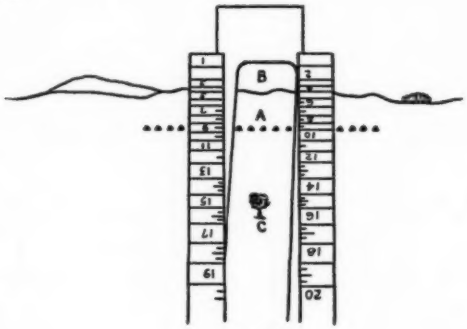


FIG. 5

Thus, to fire at the target A, at a range of 1,000 yards, we may use the skyline B as an aiming point with sight setting 500 yards or the foot of the tree C as an aiming point with sight setting 1,650.

Instead of using the rifle held in an inconvenient position for this measurement, the observer may have a detached rear-sight leaf with a cord attached as in the mil scale previously described. The cord in this case is of such a length as to bring the sight 22⅛ inches from the eye when making an observation.

A combination of the mil scale and device for range corrector and sight setting for fire by means of auxiliary aiming points is shown in Figure 6. This is the form now in use by the School of

Musketry and manufactured and issued by the Ordnance Department. It is designated the "Musketry Rule"; its length over all is 4¾ inches, and the scales are so proportioned that the rule is to be held 15 inches from the eye for measuring mils and using the inverted rear sight.

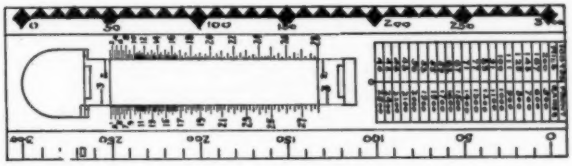


FIG. 6

Choice of an Aiming Target.

The choice of an aiming target depends primarily on the available features of the terrain that are immediately in line with the area that is to be covered with fire. At ordinary ranges, care must be taken not to choose an aiming target so that a negative sight-setting will result. Skylines are often not available on this account. Assuming that the enemy's line to be covered with fire is of the same length as our line, there are three satisfactory aiming targets from a theoretical standpoint.

First, an aiming *point* so far in rear of the enemy's line (several miles) that our fire will be very slightly convergent. In this case, the distribution and accuracy of our fire ought to be excellent, but if the aiming point is too close, the flanks of the enemy will not be covered.

Second, an aiming target consisting of a well defined horizontal *line* within a hundred yards or so of the enemy's line. In this case, the accuracy of our fire ought to be excellent, but the distribution will depend on the training of our troops since they must fire on the part of the aiming target immediately to their front in order that the distribution be good.

Third, an aiming *point* half way between us and the enemy so that all our fire will cross at the aiming point and the fire of our right flank will strike the enemy's right flank. In this case, the accuracy and distribution should both be excellent, but here again

if the aiming point is not exactly half way to the enemy, our fire may cover too much or too little of his line.

Considerable judgment and experience is required in the choice of aiming targets. Excellent results may be obtained by their judicious use, but they should rarely if ever be used if the real target is visible to the firing line.

A combination mil scale and reproduction of the rear-sight scale, placed on the reticule of a field glass, makes the handiest angle-measuring instrument for an officer.

The procedure with the rifle, detached sight leaf, or sighting rule is only as accurate as the process of aiming the rifle. Inaccuracies will occur in practice through holding of the leaf at an incorrect distance from the eye, through an inaccurate holding of the true range graduation on the target or aiming point, and an inaccurate reading of the scale opposite the aiming point or target.

These inaccuracies disappear if an exact reproduction of the rifle sight-leaf scale be engraved on the reticule of a field glass. A glass with a scale like Figure 7a has been produced, and with it, the measurement of range for use with an auxiliary aiming point becomes an easy and accurate matter.

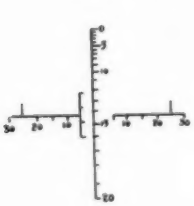


FIG. 7a

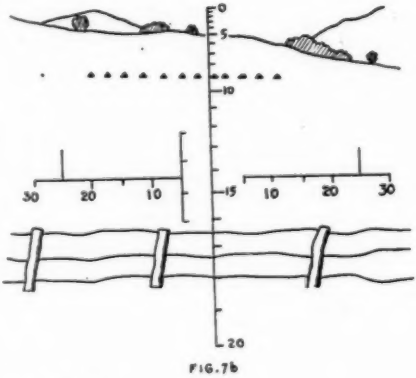


FIG. 7b

The horizontal scale is a mil scale.

In use, the graduation marking the true range is laid opposite the target. The selected aiming point will then fall opposite the sight setting to be used by the firers.

If, for example (see Figure 7b), the target is a line of heads 900 yards away, the graduation 900 on the scale would be laid on the line of heads seen through the glasses. Anyone of several aiming points will then be opposite the appropriate graduations on the scale to be used against this or that aiming point. The skyline, for example, crosses the scale at 500. If aim be taken at the skyline with 500 yards set on the rear sight, the bullets will hit in the line of heads at 900 yards as intended. The bottom wire of the fence immediately in front of the firers crosses the scale at 1,800 yards (the observer lying prone in the firing line), and if the firing line aims at this lower wire with 1,800 yards elevation, the bullet will fall in the line of heads as before. In fact, the entire landscape is available to the director of the fire, who has but to choose that point or line which, because of the color, shape, or nearness, would make the best aiming point in that particular field of view.

The Musketry Rule, or better, the field glass fitted with sight and mil scales, can be used in conjunction with an estimate in correcting ranging fire so as to get it on the target.

The correction of sights, as a result of ranging, is based upon the observation of the impact and the subsequent estimate as to its distance and direction from the objective.

In known distance practice, the strike of the bullet is on a vertical surface, and when the position is shown by the marking disk, the sight is corrected accordingly.

In combat, however, the observation of impact is usually on a surface that is rising with respect to the line of sight. In such cases, the correction of the sight must compensate not only for the horizontal distance short or over but also for the vertical distance above or below the objective.

Referring to Figure 8a, suppose VV to represent a vertical surface and the point T to be the target. If a shot fired at T strikes at the point H, the sight correction to be applied corresponds to the vertical distance HT. If T be assumed to be on a horizontal surface AT, the same trajectory will cut the horizontal surface at H'', and the sight correction to be made will correspond to the horizontal distance $H''T$. If T be assumed to be on the surface STS, rising with respect to the line of sight, the same trajectory will intersect this sloping surface at the point H'. The required correction in this case embodies two elements, a correction for the

horizontal distance short, $H'V'$, and a correction for the vertical distance below the target, represented by $H'T'$.

Similarly, the correction to be applied to a shot that is over is represented by the distance $H'''T''$ plus $H'''V''$.

From the above, it is obvious that when the target is on sloping ground, the corrections applied to the rear sight will be too small unless in addition to the correction for the actual distance short or over, allowance is made also for the angular distance of the point of impact above or below the target.

In practice, the actual distance in yards that the center of impact is distant from the target must, in most cases, be estimated. The vertical correction, however, may be measured with a fair degree of accuracy by using the type *EE* field glass with the range and mil scale or the Musketry Rule.

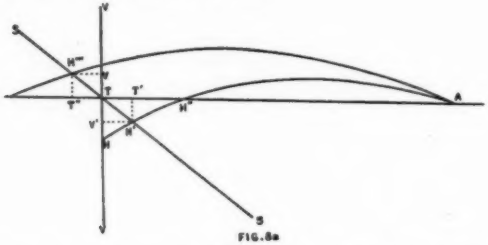


FIG. 8a

To measure the amount of this vertical correction with either the glass or the ruler, place the graduation of the range scale corresponding to the elevation actually used in coincidence with the target. Then the graduation opposite the point where the impact was noted will be the elevation necessary to use in order to correct for the vertical error. It is to be noted that this vertical correction gives the range (in terms of the sight) to the point of impact.

The vertical correction having been made, then the correction is completed by adding (if the impact is short) or subtracting (if the impact is over) a number of yards equal to the estimate of the horizontal distance from the impact to the objective and setting the sight accordingly.

Figure 8b will illustrate this method.

Assume the range to have been estimated at 800 yards. Then with the 800-yard graduation held opposite the target, the splash

of impact is observed opposite the 1,100-yard graduation and is estimated to be 150 yards short. The full correction therefore would be 1,100 yards (vertical correction) plus 150 yards (horizontal correction), or a final elevation of 1,250 yards as a result of this observation.

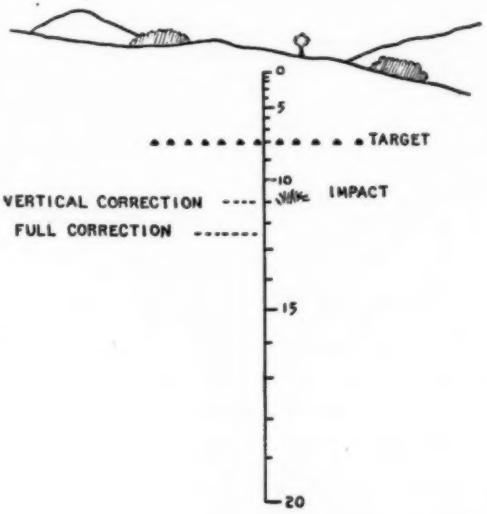


FIG. 8b.

One other feature of the Musketry Rule remains to be mentioned. This is the simple device to obtain the sight settings when it is desired to use combined sights. Set both sliders at the range, estimated or measured, to the target. If two elevations are to be used, use the sight settings indicated by the mark numbered 2 on each slide. If three elevations are to be used, use the settings indicated by the mark numbered 3 on each slide and the sight setting corresponding to the true or estimated range, making three in all.

(TO BE CONTINUED.)

Varied Ground.

Emerson vs. Sweetser

DISTRICT COURT OF THE UNITED STATES,
District of Massachusetts.

ALEXANDER M. EMERSON, *Petitioner*,
vs.
WARREN E. SWEETSER, *Respondent*.

MEMORANDUM OF DECISION
by Dodge, J., August 10, 1916.

I have listened with much interest to the learned and able arguments of counsel on both sides in this case and have endeavored to weigh what they have respectfully urged as it should be weighed. Inasmuch as they have gone over the successive provisions both of the Dick Bill and of the National Defense Act in considerable detail, I shall not undertake to go into them in any such detail in announcing the present decisions, reserving, however, the opportunity to put on file an opinion hereafter if it shall seem desirable to do so.

These are *habeas corpus* proceedings, calling, therefore, for prompt and immediate decision, and such prompt and immediate decision has already been somewhat delayed, it is true by the consent of the applicant's counsel, for the purpose of duly accommodating the United States Attorney and the officials of the War Department.

To my mind, the question turns particularly upon sections 57 and 58 and the provisions of Section 70. While Section 58 makes it clear that the National Guard, as constituted upon and after June 3, 1916, fifteen days before the issue of the call for troops here in question, was to consist for each State of its regularly enlisted militia, organized as provided elsewhere in the new act, I do not know that I should be satisfied to hold that because of Section 58 alone, the provisions of the new act would be any of

them necessarily so inconsistent with any provisions of the Dick Bill as to require me to say under the last section, 128, of the new bill that they stand repealed. But we have to take those provisions of Section 58 in connection with the provisions of Section 70, and Section 70 seems to me to be such an express and absolute declaration of the intent of Congress as to require a different conclusion. Section 69 has described the new oath to be taken by all men who are to be admitted to the National Guard after June 3, 1916. Then Section 70 makes further express and, it seems to me, clear provisions. Whereas under the Dick Bill all enlisted men belonging to the National Guard of a State were to be mustered in the federal service without further enlistment, this section 70 makes separate provisions as to such enlisted men as were on June 3, 1916, serving under enlistment contracts containing an obligation to obey the orders of the President, and besides that, to defend the Constitution; and as to those serving under enlistment contracts not containing such obligations, like Emerson's contract for service in the Volunteer Militia. The former class are by Section 70 to be recognized as members of the National Guard under the provisions of the new act for the unexpired portions of their existing enlistment contract, but the latter class are not to be recognized as members of the National Guard at all until they shall have signed a new enlistment contract, in a form prescribed, binding them to serve for six years in all, three in active and three in reserve service, under the conditions prescribed by the new act; and until they shall have taken the prescribed oath to obey the orders of the President or the governor of the State and military officers appointed over them. Having signed such prescribed contract and oath and having thus become recognized as members of the National Guard as constituted June 3, 1916, the latter class of enlisted men are to have credit for the period already served by them under their old enlistment contracts, but not having signed them, the act of June 3 expressly prohibits their recognition as members of the National Guard. I am unable to regard these provisions of Section 70 in any other light than as inconsistent with so much of the Dick Bill as related to members of the Old National Guard serving under contracts like Emerson's; and so much of the Dick Bill as did apply to them before June 3, 1916, I must regard as repealed by the new act.

It may be further added that it is not shown in this case that

Emerson has ever had offered to him any enlistment contract or any other oath than the six-year contract and the oath prescribed by Section 70. It may be added further that no attempt is made on behalf of the State of Massachusetts or its officers to hold Emerson for service under his existing enlistment contract. The evidence tending to show that State officers informed him that no further attendance by him was required I regard as competent and so rule. *I regard it further as tending to show that the State here beyond question asserts no claim to further service under the call of the President by the applicant.*

On the petition for the writ, I therefore order that the writ issue. That is all I think is necessary to say. I think that having made that order, having issued the writ, the government may appeal, and I think that on their appeal, I can hold the applicant to give security to appear when he is wanted, if the writ should issue. If, however, counsel insist that the writ should issue, the writ may issue; but if it is issued the applicant is to be discharged without further hearing, it having been agreed in open Court that the matter may be decided upon the hearing under the petition for the writ.

Editorial Department

A higher training and greater individual ability are essential today for Infantry than for any other arm. It is more difficult and it takes a longer time to train Infantry to any standard of efficiency today than to bring any other arm to a corresponding standard.

Decentralization and Territorial Organization.

The mobilization of the National Guard, supervening so closely on the passage of the National Defense Act, has almost entirely absorbed the attention of the military establishment for the time being and has left but slight opportunity for the consideration of the many important innovations contemplated by the Act. It is, moreover, probable that considerable time must elapse before the personnel required for carrying into effect the more important provisions of the new legislation will become available. Eight hundred additional officers and 1,500 noncommissioned officers cannot be created by a stroke of the pen.

At the present stage of affairs, it is scarcely to be expected that the method which will be pursued in establishing the system contemplated by the Act and which will finally govern its operation, should be definitely developed or even clearly outlined. What ultimate form the system will take is at present necessarily a matter of conjecture. There are, however, certain indications that the present system, devised for the administration of a small army, must undergo material alteration, if it is to solve its problem efficiently, and that the changes made must for the most part be in the direction of greater decentralization and a more highly developed territorial organization of the country.

In any given section of the United States over which the present military system extends—or more accurately speaking, to which it is appended—the following military agencies of the Federal government are now in operation under the control of the administrative authorities named:

Units of the Regular Army under the control of Department Commanders;

Reserve of the Regular Army, when not called to the colors, under the supervision of the Adjutant General of the Army;

Units of the National Guard—so far as they are under Federal authority—partially under the supervision of the Militia Bureau of the War Department and partially under that of Department Commanders;

Inspector-instructors and sergeant-instructors on duty with the National Guard under the same Federal control as units of the National Guard;

Military training camps under the control of Department Commanders;

Military instruction in public schools and officers on duty thereat under the supervision of a committee of the General Staff;

Recruiting stations and recruit depots under the control of the Adjutant General of the Army;

Supply depots under the control of supply departments.

Nearly all of these institutions are to be greatly expanded when the new legislation has been given full effect. In addition, the following new institutions will be created under the provisions of the National Defense Act:

The Officers' Reserve Corps;

The Reserve Officers' Training Corps;

The Enlisted Reserve Corps;

Rifle ranges for instruction of civilians in rifle practice (under Section 113) under the supervision of a "director of civilian marksmanship."

Under the existing system, the control of all these institutions is highly centralized and is to a considerable extent vested in the various bureaus of the War Department. Instead of dealing with tactical or territorial commanders, the War Department transacts a large part of its business direct with individual officers. This system, applied to the larger sphere of military activities embraced in the new legislation, is sure to overwhelm officers on duty in the War Department with a mass of detail which will make it impossible for them to develop the broad questions of policy to which their attention should be devoted. This evil works in a vicious circle: the absence of policy makes it constantly necessary for subordinate officers to refer questions of detail to higher authority, and the handling of a mass of detail

prevents officers charged with the development of policies from devoting their time to their legitimate functions. The Chief of the Militia Bureau alone now has under his orders 135 officers on duty as inspector-instructors in 48 different States and Territories, and when the National Defense Act is in full effect, this number will probably be increased to from 300 to 500. The Adjutant-General deals with some 150 recruit depots or recruiting stations. The college committee of the General Staff supervises the military instruction of more than 100 schools and colleges, requiring the absence on tours of inspection during a considerable part of the year of officers whose proper station and duties are in the War Department at Washington. It is almost needless to add that the supervision exercised by these various bureaus is necessarily intermittent and imperfect. Efficient supervision can only be exercised by authority whose sphere is limited to certain restricted territory and which is close enough at hand to observe deficiencies and enforce corrective measures.

Nor would it be a step toward decentralization to delegate the functions now exercised by the War Department to the present territorial departments. These commands are entirely too cumbersome for the exercise of effective control. The Department of the East alone includes nearly two-thirds of the population of the United States, that is to say, two-thirds of our potential military resources. It is not decentralization for authorities in Washington to delegate to a commander located in New York control over troops raised in Florida. The direct supervision of the military institutions that are or will be located in the State of New York alone would seem to be an ample task for one commander and a considerable staff.

The continuance of the present system will, moreover, result in great waste of energy and duplication of effort. Officers serving in different capacities, as for example as inspector-instructors of the National Guard or on college duty, can only exceptionally be made available for any duty except the one for which they are expressly detailed. The military instructor at a college whose official duties often call for only three periods of instruction per week cannot be made available for the instruction of an organization of the National Guard located in the city in which he is stationed. Neither college instructor nor inspector-instructor can

be made generally available for duty at training camps or as instructors of civilian marksmanship.

It would seem that the situation could best be met by a more highly developed territorial organization with corresponding decentralization of authority. Territorial commanders could be charged with the supervision of all forms of military instruction within the limits of their territory wth such exceptions, *e. g.*, service schools and technical establishments, as are absolutely necessary. There is nothing so peculiarly special in the nature of military instruction at colleges, or of the National Guard, or of training camps or reserve officers that the general supervision of all classes of instruction by a local headquarters in any given territorial subdivision is not practicable. Under the coordinating action of the territorial commander, the greatest possible output could be obtained from an instructional corps placed under his orders. This would involve the delegation to territorial commanders of many of the questions of detail now handled by the bureaus and the devotion of the energies of the War Department to the broad questions of policy and a general supervision of their application which are its legitimate functions.

This is a result to be devoutly hoped for. But we are traditionally loath to surrender authority in details and sometimes equally loath to exercise that properly pertaining to higher commands. The colonel who would direct the details of administration of all twelve of his companies, at the same time neglecting to master the tactical handling of his three battalions in combined operations, was not long ago a familiar figure, and his spirit is in many ways still with us.

Not only is a highly developed territorial organization—to which of course tactical organization should ultimately be related—necessary to efficient peace administration, but it is absolutely indispensable to the efficient conduct of war. The internal organization of the country, which involves the conversion of its potential military resources into actual fighting power, is quite as important as the organization of the fighting troops. Our present system must break down as it always has the moment that any serious strain is applied to it. Without a well developed organization or at least the cadre of such an organization, there can be no thoroughly efficient mobilization, no proper system of recruit training, no efficient handling of transportation problems.

The conditions which have existed up to the present time are largely attributable to the lack of a sufficient personnel to make a territorial organization effective and of an authorized sphere for its employment. Under the provisions of the National Defense Act, this condition no longer obtains; sufficient additional officers are provided to put into effect a thoroughly national organization.

The present and the next few years are years of golden opportunity for the Army. We must not neglect this opportunity for weaving our organization into the national fabric instead of remaining as heretofore an excrescence on it. To just the extent that we succeed in accomplishing this purpose shall we be strong for the future and just to the extent that we remain excrescent shall we be weak and the shuttle-cock of politics. Like every other institution, the Army will be worth just what it makes itself worth. No plea of military necessity or of the necessity for military force will avail in the face of our failure to become a national institution when the present interest has subsided and the country begins to compare the cost with the result.

Shortage of Officers on the Border.

Reports from regiments on the border indicate that a shortage of officers in the regular regiments is beginning to be seriously felt. It is said that in one regiment only 19 officers are present for duty and that a number of others are in approximately the same condition.

This situation was inevitable. The formation of the new regiments could not be effected without making a deficiency felt in the personnel of existing regiments. New officers to fill the vacancies created cannot be commissioned at once, and it is probable that even after their appointment, considerable time must elapse before they can be anything but an additional burden on officers already present with the regiments.

It is also said that the shortage is aggravated by the necessity for detailing regular officers as instructors of the National Guard.

Naturally, these conditions have resulted in a demand that officers be released from other duties wherever practicable and sent to the border in order to make up as far as possible the deficiencies there existing in commissioned officers. It has been suggested that as a move in this direction, the sessions of the

service schools planned for the current year should be adjourned until more officers are available.

One cannot presume at a distance to pass judgment on the necessities of the situation or weigh with precision the relative importance of the different demands for officers. Unquestionably the present requirements on the border are great, and the duty devolving on the officers of the regiments is excessive. At the same time, we question the advisability of permitting the present situation to divert our energies entirely to one phase of the military development of the country. We have problems before us of the utmost consequence to our future. On this point we must be neither narrow nor skeptical. We must come to a realization of the fact that the national defense is something bigger than either the Army or the National Guard and that our whole future is bound up in the present.

The shortage of officers is, after all, more relative than actual. In foreign armies on a war footing, a battalion of 1,000 men is led by 19 or 20 officers, which is about the ratio in the most depleted regiment on the border that we have heard of. As far as the National Guard is concerned, our system presupposes that its own officers will be charged with its instruction and management after it has been brought into Federal service. The work of the regular officers is done when the regiments are mobilized. It is scarcely congruous that a lieutenant or captain should be placed in the position of showing a colonel how to command his regiment. Moreover, he cannot effectively fulfil the duties of a military instructor except in a position of command, and here again the law provides a way by which his services can be made available in the provision authorizing him to accept a commission in the National Guard. We sometimes think that there is too great a tendency to regard the problem of a military instructor as identical with that of a college instructor—as an academic or intellectual problem. There is almost no analogy between the cases; the greater part of the task of bringing a new regiment to a state of effectiveness is a task of discipline which is inseparable from the idea of command.

By all means, let us hang on to every shred of policy we ever developed that is worth clinging to; we cannot be said to be overburdened in this respect. Let the service schools continue; they are indispensable to our progress, and we owe more to them for

whatever improvement we have made in the last fifteen years than to any other single agency. Germany has found it to her profit to continue her military schools in operation while engaged in the greatest war in history, and France is now following her example by reopening St. Cyr. In the face of these facts, it would fairly seem that we should not allow a slight flurry on our southern boundary to divert us completely from whatever continuity of purpose we may have acquired. On the whole, however, we are making some progress in this respect; during the recent mobilization, there was much less tendency than has usually been the case to jump to the conclusion that because we were confronted with a somewhat unusual situation, "the lid was off" and no rules hold good.

There might possibly be some temporary advantage in sacrificing all other military objects to the immediate training of the troops now on the border. But it is fairly certain that such a course would be an eventual loss. For it is above all things important at the present time to establish and solidify a system that will be enduring.

¶

A Machine-Gun Corps—The Rôle of Technique.

In view of the important rôle which machine guns are playing in the present European war, it is often proposed that the personnel charged with the service of the machine guns be organized as a separate branch of service or constituted as a "corps." Most of the argument that we have heard in favor of this proposal is based upon technical considerations and the special advantages that would result through having a corps that can devote its entire attention to special training with the machine gun.

This subject is worthy of careful study. To arrive at correct conclusions in regard to it, it is necessary to have a clear conception of the rôle of technique in the division of an army into branches of the service. We fear that the sharp distinction between branches of the service in our army and their general isolation from each other that has been the rule in our peace training, have led to the misconception of technique as the basis for the separation of the arms. Nothing could be further from the case; we have only to examine the history of the origin of the different arms of the service to convince ourselves that technique was a

consideration of a very secondary order in determining the division of any army into the several combatant arms.

The basis of the division into arms of the service is unity of command. The moment that combatant troops exercising a special function begin habitually to take up a position in action so far removed from the other fighting troops that they cannot be controlled by the same commanders, the necessity for placing them under separate commanders who can coordinate and combine their action arises, and a new branch of the service is born. Thus in the days when artillery habitually fought in the infantry firing line, guns were assigned to battalions and manned by the battalion personnel. Had the artillery been organized as a separate branch of the service, its higher commanders would have seen their units dissolve upon going into action and themselves without a function on the battlefield. As the range of artillery increased, the guns were removed from the infantry fighting lines and thus passed out of the control of infantry commanders, and the necessity for a new branch of the service arose.

We see this same principle illustrated today in the trench mortars which are manned by infantry. It is also remarkably demonstrated in the objections raised to one of the proposals which Captain Laffargue makes in his "Study on the Attack in the Present War," published in this issue of the INFANTRY JOURNAL. Captain Laffargue proposed in effect that mountain guns should be emplaced in the trenches for the purpose of combating machine guns by direct fire and that, manned and drawn by artillerymen, they accompany the infantry attack to compensate for the falling off in the effectiveness of the artillery as the infantry advance progressed. To this, according to *La Revue Militaire Suisse*, his comrades in the artillery objected that the service of guns thus emplaced and employed was properly a function of the infantry and should not be imposed on the artillery.

These considerations would seem to make it evident that it is not the part of good organization to form the present machine-gun units attached to infantry and cavalry regiments into a "machine-gun corps." It does not, however, prove that there is no place in organization for such a corps. On the contrary, should it be considered that we shall probably have to face conditions similar to those now prevailing in Europe, the necessity for placing a large reserve of fire in the hands of higher com-

manders will require the organization of machine-gun units which can be quickly put into action wherever the development of a large volume of close-range fire is required. Such units might well be organized into a corps. But here again, the basis of the organization is not technique but the fact that the units are removed from the control of commanders in the fighting line. It is to be observed that when the English organized a machine-gun corps they did not include in it the units attached to infantry regiments. This organization is parallel to that which was observed when the artillery was first organized as a separate arm of the service; the new arm did not include the battalion guns but only those which were to be held as a reserve in the hands of higher commanders.

Thus in this respect as in all others, technique is the servant of tactics. This is far from equivalent to saying that technique is the less important of the two elements. Any factor which is indispensable to military success is of equal importance with any other factor. The question is not one of importance but of order and subordination, of cause and effect.

It is perfectly evident that if one set of officers can master any particular sort of technique, any other set can do so equally well if they are worthy to hold commissions at all. There is, therefore, no reason for the distribution of troops into arms of the service on the basis of technique. Any particular variety of technique can be developed within any branch of the service without the necessity of creating a separate arm which would destroy unity and hierarchy of command. It is only when a separate sphere of operations for any class of combatants is created that the necessity for creating a separate branch of the service arises for the very purpose of preserving this unity and hierarchy.

Moreover, the conditions of the battlefield do not lend themselves to a nice distribution of functions among several elements. All must be more or less capable of employing the methods of action of the other. We cannot count upon the presence of a specialist at the exact place where his services are needed on the field of battle. This fact has become strikingly evident in the present war. Writing on this subject, Colonel Welck of the German Army says in an article which we publish in this magazine:

What effect these experiences of the present position warfare will have upon the later training and employment of troops, the

future alone can tell. But certain fundamental indications can, however, already be determined. Among these we count upon a general cooperation of all arms of the services, with a more or less sacrifice of their distinguishing characteristics. Field fortifications, which have reached an extension heretofore unknown, will not be constructed by pioneers alone but also by infantry and cavalry, not mentioning the fortification troops formed for this special purpose. The service of guns, telegraph, and telephone as well as of all kinds of observation posts, will devolve upon all arms of the service.

There is probably no army in the world in which the training of troops and officers is so narrowly special as in our own. To judge from our system of training, one might think that infantry always fought infantry alone and that the only function of artillery is, as one writer has recently expressed it, "to create a volume of fire when and wherever needed." An army trained on these lines will never be capable of adaptation to the new conditions which always arise with each successive war. The infinite variety of situations that arise in war must constantly bring into the foreground now one and now another means of effecting, or aiding in, the task of destruction. An army whose training is not flexible enough to enable it to meet a change in conditions from those anticipated is sure to be surprised by the developments of its first campaign. No form of organization can be so precisely calculated as to fit exactly the conditions that develop in campaign, and readjustment will always prove necessary; which is not to say that a precisely calculated organization is not a necessity as a basis for preparation. The parts of any machine must be designed and adjusted for mutual engagement before a machine that will work at all can be assembled.

We do not underrate the importance of specialization. Specialization is necessary to continued progress and development. But it should not assume so narrow and exclusive a form as to be inadaptable to the rough and tumble conditions of the battlefield where all arms are more or less intermingled. As a general rule, it may be said that no professional officer of the combatant arms should be so specially trained that he cannot in case of necessity acceptably command a unit of any other combatant arm. His specialism will not suffer from his versatility but on the contrary will be enhanced by it. The distinction between specialism and general adaptability may be likened to the

contrast between the foreground and the background of a picture; but under our system of training, our picture is for the most part foreground.

We have, moreover, the highest regard for technique when it is accompanied by tactical skill. Mastery of technique in any field is a mark of thorough craftsmanship. A more thorough knowledge of all technical methods that find application on the field of battle and in campaign should be cultivated by all arms of the service. But important as it is—its importance has nothing to do with the question—technique is not the controlling consideration in the organization of the fighting elements of an army.

For these reasons, while we regard a machine-gun corps as a desirable development after the organization now provided by law has been effected, we do so with the reservation that the corps should not include the units now forming part of the regimental organization. As a further step toward greater efficiency in this line, a machine-gun inspection might be created, just as there might now well be infantry, cavalry, and field artillery inspections. Indeed all our conceptions on the subject of the function of inspection need broadening. It has been a characteristic of all efficient military organizations of modern times that the agency charged with the development of any arm is also charged with the service of inspection of that arm. The reason is patent; the inspection is for the purpose of determining the measures necessary for the development of a particular service, and with this function should go the power to initiate such measures. As a separate function, inspection is of no particular significance. We have only to consider the greater efficiency of the arms of our service which are supervised by the equivalent of the European "inspections" to note the difference in the efficiency of the two methods.

The narrow specialism in our service—which be it remarked in passing does not as a rule produce great specialists—is an evil directly traceable to our promotion system and to promotion interests. As long as it persists, our officers will never attain the state of efficiency of those of the army which Colonel von Welck describes in which officers in all arms of the service have transferred to other arms during the progress of a great war and performed their duties acceptably; neither will they become distinguished specialists in their own field. The most practicable

means of improving our condition in this respect and of ultimately eliminating the promotion evil is the single list for lieutenants, which we have advocated in previous issues of this magazine. Under such a system, we should finally have officers in all arms of the service who appreciate the importance and the function of other arms and the true significance of the partition of an army into arms of the service—an appreciation which is singularly lacking at the present time.

Book Reviews.

Notes on Elementary Field Training. By Grenadier (pseudonym). London: Hugh Rees, Ltd. Cloth note-book with blank pages, 7 x 5 inches.

For once we have a real note-book, prepared not primarily for sale but for service use. These notes of actual experiences in real war were compiled by an officer of the British service fresh from the front in France.

In the mass of military publications which have been thrust upon the Army for some years, this volume stands out as a practical useful book. It is refreshing to look over these notes which represent something else than half-baked or overdone ideas and obsolete maxims from which all military ideas have long been lost.

Its principal value consists in the new ideas of training presented which will serve Infantry officers as texts for practical talks and for training problems, because it is apparent that one is dealing with measures taken in real war.

Each page is faced with a blank in order that each tactical subject can be amplified or added to.

Part I covers the attack, the defense, outposts and trench making, following the particular phase of action now being carried out in France. It is perfectly apparent that some of our hypothetical manuals based on symmetry and landscape gardening are in need of a thorough and drastic revision.

The following quotations are inserted to show the practical value of this little book:

The object of an attack is to reach a position from which the enemy's rifle and machine-gun fire can be beaten down. (This range is sometimes as short as 50 yards.) The reason for this: unless the attackers have immensely larger numbers, they cannot charge infantry who continue to fire accurately and rapidly. This the Germans continue to disregard.

The heading notes for platoon training also illustrate the scope of the book and its suggestive value as a training guide:

(*a*) Passing a wood; (*b*) Breaking from cover; (*c*) Re-form-

ing; (*d*) Re-inforcing; (*e*) Mutual fire to cover rushes (*f*) Passing messages; (*g*) Fixing bayonets; (*h*) Charge and pursuit; (*i*) Reforming after the capture of a position.

Here we have some real data on the technique of infantry, which unfortunately most of us think is a natural endowment. This note-book is essentially for infantry officers and for troops acting as infantry. It is of great value not only for experienced officers but to the young man just beginning his military career.

D. T. M.

Kitchener's Mob. By James Norman Hall. Boston: Houghton, Mifflin Co., 1916. Cloth, 12mo, 201 pages. Price, $1.25.

I made a serious blunder when I asked one of them a question about Ypres, for I pronounced the name French fashion, which put me under suspicion as a "swanker."

"Don't try to come it, son," he said. "S'y 'Wipers.' That's what we calls it."

"Shorty" Holloway was initiating our American author into the mysteries of trench life, and little time was spent in preliminaries—

"Now, wot you want to do is this: always 'ave an extra shirt in yer pack. Don't be a bloomin' ass an' sell it fer a packet o' fags like I did. An' the next time you writes to England, get some one to send you out some Keatings"—he displayed a box of grayish-colored powder—"It wont kill 'em, mind you! They aint nothin' but fire that'll kill 'em. But Keatings tykes all the ginger out o' 'em. They aint near so lively arter you strafe 'em with this 'ere powder."

This book is an account of the adventures of an American volunteer in Kitchener's army, the "First Hundred Thousand" of Ian Hay Beith, and is possibly the equal of that book. Unlike it, it is the narrative of a private soldier, and the view of the realities of trench life is even closer and more intimate. It gives one an idea of what the fighting in Europe is like and why an "advance of 200 yards on a front of one mile" is really an achievement. Some of our engineering books on field fortifications will have to be modified rather extensively if such trenches are to be the rule of the future, 7 or 8 feet deep and possibly 2 feet wide, with traverses every fifteen feet.

Like the author of "My Fourteen Months at the Front," the present writer was a young American caught in the maelstrom

of the "mob spirit," who took the "King's shilling" with an unused ticket to New York in his pocket.

One cannot fail to be entertained and instructed by reading the book.

The Red Horizon. By Patrick MacGill. New York: George H. Doran Company, 1916. Cloth, 12mo, 304 pages. Price, $1.25.

Another story by a private soldier, this time a member of the "London Irish" regiment. There is something appealing about these books not to be found in the writings of the professional correspondents that literally swamped the editors' desks in the early days of the war. So much has appeared in our own newspapers of late about the hardships of our National Guard troops in their journey to the Mexican border and the lack of Pullman sleepers that it is interesting to read what real war is like—

Our trucks were already waiting, an endless number they seemed, lined up in the siding with an engine in front and rear, and the notice "hommes 40, chevaux 20" in white letters on every door. . . . A bale of hay bound with wire was given to us for bedding, and bully-beef, slightly flavoured, and biscuits were doled out for rations.

Shades of a Congressional investigation!

"Bill" is a cockney character who lends his wit to the banter of the long hours in the trenches—

"I never like the bloomin' trenches," said Bill. "It almost makes me pray every time I go up."

"They're not really so bad," said Pryor. "Some of them are quite cushy (nice.)"

"Cushy!" exclaimed Bill, flicking the ash from his cigarette with the tip of his little finger. "Nark it, Pryor, nark it, blimey they are cushy if one's not caught with a shell going in, if one's not bombed from the sky or mined from under the ground, if a sniper doesn't snipe 'arf yer 'ead off, or gas doesn't send you to the 'eaven, or flies send you to the 'orspital with disease, or rifle grenades, or pip-squeaks, and whizz-bangs don't blow your brains out when you lie in the bottom of the trench with yer nose to the ground like a rat in a trap. If it wasn't for these things and a few more, the trench wouldn't be such a bad locality."

One more example of Bill's loquacity. Some new men met

him while on relief from the trenches and wanted to know all about what was before them.

"Tell me something I can believe," said the red-haired youth.

"Am I not telling you something?" asked Bill. "Nark it, matey, nark it, I tell Gospel stories and you'll not believe me."

"But it's all tommy rot."

"Is it? The Germans didn't think so when I charged plunk into the middle of 'em. Yer should 'ave been there to see it. They were all around me and two taubes over 'ead watching my movements. Swish! my bayonet went through the man in front and stabbed the identity disc of another. When I drew the bayonet out, the butt of my 'ipe (rifle) would 'it a man behind in the tummy. Ugh! 'e would say and flop, bringing a mate down with 'im maybe. The dead was all 'round me and I built a parapet of their bodies, puttin' the legs criss-cross an' makin' loop 'oles. Then they began to bomb me from the other side. 'Twas gettin' 'ot I tell you and I began to think of my 'ome: the dug-out in the trench. What was I to do? If I crossed the open they'd bring me down with a bullet. There was only one thing to be done. I had my boots on me for three whole weeks of 'ot weather, 'otter than this and beer not so near as it is now——"

"Have another drink, Bill?" I asked.

"Glad yer took the 'int," said my mate. "Story tellin's a dry fatigue. Well, as I was sayin', my socks 'ad been on for a 'ole month——"

"Three weeks," I corrected.

"Three weeks," Bill repeated and continued. "I took orf my boots. 'Respirators!' the Germans yelled the minute my socks were bare, and off they went leavin' me there with my 'ome-made trench."

Golf Club Selection. By Harry Vardon. Newark (O): Burke Golf Co., 1916. Leather, small 16mo, 48 pages. Price, 35 cents.

A little publication is one that should interest such officers as are stationed where there is an opportunity to play the game of golf. The author gives advice on the clubs necessary for the beginner and the additions that may be made as he progresses. He discusses the spring and balance of the shaft of the clubs, and the sort of clubs advisable for different types of physique. The book is indexed and contains a short glossary of golfing terms.

The Engineer in War. By Major P. S. Bond, Corps of Engineers. New York: McGraw-Hill Book Company, Inc., 1916. Leather, 12mo, 187 pages, illustrated. Price, $1.50.

An epitome of the numerous functions and duties of engineer troops in campaign, the book being reprinted with revisions and additions from a series of articles in *The Engineering Record*. It is written in popular style and contains many illustrations; a glossary and comprehensive index add to its value.

Books Received.

Antwerp to Gallipoli. By Arthur Ruhl. New York: Charles Scribner's Sons, 1916. Cloth, 8vo, 304 pages, illustrated. Price, $1.50.

The Balkan Wars. By Major Clyde S. Ford, Medical Corps, U. S. A. Fort Leavenworth: Press at Army Service Schools, 1915. Paper, demy 8vo, 150 pages. Price 75 cents.

The Neutrality of the United States in Relation to the British and German Empires. By J. Schield Nicholson, Sc.D., LL.D., F.B.A. London: Macmillan & Company, Ltd., 1915. Paper, demy 8vo, 92 pages. Price 20 cents.

The Mounted Rifleman. A Method of Garrison Training and Field Instruction of Cavalry. By Brig.-Gen. James Parker, U. S. Army, Menasha: George Banta Publishing Company, 1916. Cloth, 8vo, 164 pages. Price, $1.00.

Why Preparedness. By Captain Henry J. Reilly. Chicago: Daughaday and Company, 1916. Cloth, 8vo, 400 pages, illustrated. Price, $2.00.

The Rise of Rail Power in War and Conquest. By Edwin A. Pratt. Philadelphia: J. B. Lippincott Company, 1916. Cloth, 8vo, 405 pages. Price, $2.50.

Awake! U. S. A. By William Freeman. New York: George H. Doran Company, 1916. Cloth, 8vo, 453 pages, with diagrams. Price, $2.00.

Trained Citizen Soldiery. By Major John H. Parker, U. S. Army. Menasha: George Banta Publishing Company, 1916. Cloth, demy 8vo, 206 pages. Price, $1.25.

Small Problems for Infantry. By Captain A. W. Bjornstad, 16th Infantry. Fort Leavenworth: Army Service Schools, 1916. Limp Keratol, 191 pages, including Gettysburg 3-inch map. Price, 75 cents.

The Soldier's Catechism. Compiled by Major F. C. Bolles, Captain E. C. Jones and Captain J. S. Upham. New York: Doubleday, Page & Co., 1916. Cloth, 12mo, 177 pages, illustrated. Price, $1.00.

THE UNITED STATES INFANTRY ASSOCIATION

"The object of the Association shall be to promote the efficiency of the Infantry arm of the military service of our country by maintaining its best standards and traditions, by fostering esprit de corps, by the dissemination of professional knowledge, and by the exchange of ideas as to the utilization of such knowledge with particular reference to the rôle of infantry in modern war."—Article III of the Constitution.

OFFICERS.

President:

Colonel Edwin F. Glenn, Infantry.

Vice-President:

Lieut.-Colonel W. M. Wright, Infantry.

Secretary and Treasurer:

First Lieut. G. A. Lynch, Infantry.

Additional Members of Executive Council:

Major W. S. Graves, Infantry.
Major Joseph C. Castner, Infantry.
Captain George H. Estes, 20th Infantry.
Captain D. E. Nolan, 30th Infantry.
Captain Hugh A. Drum, 23d Infantry.
Captain Fred R. Brown, 9th Infantry.

CONDITIONS OF MEMBERSHIP.

All commissioned officers in good standing, or former commissioned officers of honorable record of the regular or volunteer military or naval service and of the organized militia are eligible for regular or associate membership in the Association. Membership dates from the first day of January or July nearest the date of enrollment.

Dues are $1.00 annually, payable in advance. Payment of dues entitles a member of all the privileges of his class and to all ordinary publications of the Association except the INFANTRY JOURNAL, to which subscription is extra. Members, however, may obtain the JOURNAL for $2.00 the first year, and $1.00 yearly thereafter.

All communications should be addressed to the Secretary, United States Infantry Association, Room 506, Union Trust Building, Washington, D. C. Cable address: Infantry, Washington.

The Infantry Prize.

FIRST PRIZE.

One Hundred Dollars in Cash and Life Membership in the United States Infantry Association.

SECOND PRIZE.

Fifty Dollars in Cash.

SUBJECT.

The subject will be optional with the writer but must be one of vital interest to the Infantry arm of the service. The importance and timeliness of the subject will be one of the factors considered in making the award.

RULES.

For rules governing the competition, see July-August, 1916, number of the INFANTRY JOURNAL.

Changes in the Executive Council.

At a meeting of the Executive Council of the Association on August 9, 1916, Captain Fred R. Brown, 9th Infantry, was appointed a member of the Executive Council, vice Major Sigerfoos resigned.

At a meeting of the Executive Council on September 7, 1916, the resignation of the following officers of the Association was accepted to take effect on the dates set after their respective names, viz.:

Lieut.-Colonel W. M. Wright, Infantry, Vice-President, January 1, 1917;

Captain D. E. Nolan, 30th Infantry, Additional Member of Executive Council, January 1, 1917;

First Lieut. George A. Lynch, Infantry, Additional Member of Executive Council, Secretary and Treasurer of the Association, and Editor of the INFANTRY JOURNAL, November 1, 1916.

Captain Merch B. Stewart, 5th Infantry, was appointed an Additional Member of the Executive Council, Secretary and Treasurer of the Association, and Editor of the INFANTRY JOURNAL, to enter upon the duties of those offices on November 1, 1916, vice Lieutenant Lynch, resigned.

Annual Meeting—Election of Officers.

The Annual Meeting of the Infantry Association will be held at the office in the Union Trust Building at 5 p. m., Saturday, December 16, 1916. The election of officers will be held, and all ballots must be received by that time in order to be counted.

It is considered desirable that a sufficient number of members of the council be selected from among the officers stationed in or near Washington to permit of a quorum being called for the transaction of business. Captain Merch B. Stewart, 5th Infantry, has been selected by the Council as editor of the INFANTRY JOURNAL, and past experience has shown that it is desirable to have the editor act as secretary and treasurer, and if elected as a member of the Council, Captain Stewart will be appointed to this office.

All regular members of the Association are entitled to vote for the election of officers, and may vote for any individual they desire. Ballot will be found on back of this page.

The following ticket is proposed by members of the Executive Council of the Association stationed in Washington:

President:

Colonel Edwin F. Glenn, 18th Infantry, to succeed himself.

Vice-President:

Lieut.-Colonel Charles S. Farnsworth, Infantry, vice Wright.

Additional Members of the Executive Council:

Major Peters C. Harris, Infantry, vice Graves.
Major Truman O. Murphy, Infantry, vice Nolan.
Captain George H. Estes, 20th Infantry, to succeed himself.
Captain Merch B. Stewart, 5th Infantry, vice Lynch.

Any nominations that any branch of the Association may desire to make will be published in the November-December, 1916, number of the INFANTRY JOURNAL.

New Members.

McCleary, Oliver S., 1st Lieutenant, 37th Infantry.

Bowie, Jr., Washington, Lieutenant-Colonel, 5th Maryland Infantry.

Codori, Charles F., 1st Lieutenant, Philippine Scouts, Manila, P. I.

Grant, Joseph H., 2d Lieutenant, Infantry.

APPLICATION BLANK

Place.....

Date.....191

THE SECRETARY,
UNITED STATES INFANTRY ASSOCIATION,
UNION TRUST BUILDING,
WASHINGTON, D. C.

Sir:

Please enroll me as a member of the United States Infantry Association. I enclose herewith ..... for $3.00 for the first year's dues and subscription to the INFANTRY JOURNAL, which please send until further notice to the address given above.

Respectfully,

Name .....

Rank .....

Dues and subscription for first year, $3; $2 annually thereafter, payable in advance.